E. O. SCHWEITZER MANUFACTURING
A DIVISION OF SEL

# *Fault Indicators and Sensors*

*2009 Catalog*

***Making Electric Power Safer, More Reliable, and More Economical®***

## Company Overview

In 1950, after presenting ideas and prototypes to Commonwealth Edison in Chicago, Edmund O. Schweitzer, Jr. founded E. O. Schweitzer (EOS) Manufacturing for the purpose of designing and manufacturing line-powered fault indicators. Today, utilities around the world rely on fault indicator technology to reduce fault-finding time and quickly restore system power after a fault occurs. EOS Manufacturing has sold millions of high-quality fault indicators, voltage indicators and sensors, and split-core current transformers to over 1,000 domestic and international customers.

EOS Manufacturing became a division of Schweitzer Engineering Laboratories (SEL) in 2005 and now sells its products marked with the SEL logo. The high-quality fault indicators and sensors fit well with the SEL mission—to make electric power safer, more reliable, and more economical. In turn, the SEL commitment to quality and innovation continues to help EOS Manufacturing develop new products and better serve its customers. SEL protective relays and recloser controls, coupled with SEL LINAM® and AutoRANGER™ fault indicators, and RadioRANGER™ Wireless Fault Indication Systems, improve the reliability of electrical distribution systems.

*EOS Manufacturing, Lake Zurich, Illinois.*

## Letter From the President

SEL began 25 years ago with the world's first digital distance relay. Some now say that marked the beginning of smart-grid thinking. Those were pre-Internet days, and the desktop computer was a novelty. SEL started with one product, which offered to protect, monitor, control, and locate. Today, we offer a complete range of products for virtually every aspect of the control, protection, metering, and monitoring of electric power systems for utilities, industry, and commerce. SEL equipment is at work in more than 100 countries today, in utilities, oil refineries, water and wastewater facilities, factories, pulp and paper plants, universities, ships, shopping centers, high-rise buildings, residential neighborhoods, and more. We appreciate and respect the confidence that you place in us.

As SEL celebrates its 25th anniversary, our E. O. Schweitzer Manufacturing Division celebrates its 60th anniversary. My father started EOS Manufacturing in 1949, designing and manufacturing fault indicators first for Commonwealth Edison in Chicago, and then for many other customers. The fault indicators, split-core current transformers, and voltage sensors and indicators made by EOS Manufacturing contribute to SEL's ability to provide complete distribution system solutions to our customers around the world.

As power quality becomes increasingly important, more customers realize the tremendous potential of fault indicators to reduce customer outage time—and even reduce the number of outages, in some cases. The result is that customers experience fewer, shorter outages, and utilities' SAIDI, CAIDI, and SAIFI reliability metrics improve.

The SEL RadioRANGER Wireless Fault Indication System we introduced not long ago is now helping line crews at many utilities to find faults without opening, entering, pumping, and draining multiple vaults. Customers with paper-insulated lead cable (PILC) on their distribution systems can now use the RadioRANGER to find faults faster on PILC, too. SEL has just introduced the world's first fault indicator for PILC, based on an idea documented by my father's 100th patent.

Over the next 25 years, we believe SEL's role will continue to grow, and that the innovations from our EOS Manufacturing Division will be part of that growth. We are now a proven supplier of complete systems as well as products; our capacity is growing to meet demands in many sectors. And, we listen. The challenges you and we face today are the motivation and fuel for tomorrow's solutions.

Sincerely,

Edmund O. Schweitzer, III Ph.D.
President

## Warranty

All LINAM and AutoRANGER products manufactured by the E. O. Schweitzer Manufacturing Division of SEL come with a full, five-year product warranty, the longest in the fault indicator industry. The RadioRANGER Wireless Fault Indication System comes with a full, ten-year warranty.

# Fault Indicating and Sensing

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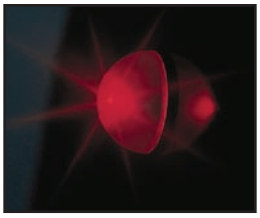
# Fault Indicating and Sensing

## Advantages of SEL Fault Indicators

- Compact, lightweight construction simplifies installation.
- Strong, simple clamping mechanisms that fit a variety of conductor sizes ensure fast, reliable installation.
- All LINAM® and AutoRANGER™ products manufactured by E. O. Schweitzer Manufacturing come with a full, five-year product warranty; the RadioRANGER™ Wireless Fault Indication System comes with a ten-year warranty.
- The RadioRANGER eliminates the need to open, enter, pump, or drain multiple underground vaults to find the location of a fault.
- Trip-value settings range from 50 A to 1200 A, and the AutoRANGER automatically adjusts its trip value based on the load current.
- Displays are easy to spot, easy to read, and require a minimal number of holes to be drilled in a transformer cabinet for installation.
- Any SEL fault indicator that uses batteries relies on patented technology, offering the longest cumulative flashing-hour life in the industry. As a result, SEL fault indicators require little, if any, maintenance.
- Auxiliary contact options available on most underground models enable SCADA compatibility.
- Magnetic cable guides keep remote display and sensor wiring neatly in place.
- The paper-insulated lead cable (PILC) sensor is a one-of-a-kind solution for fault finding on these cables.

## Underground Display Options

*Tamperproof Bolt Display*



*BEACON Bolt® Display*

*Standard "V" Display (BEACON™ versions also available)*

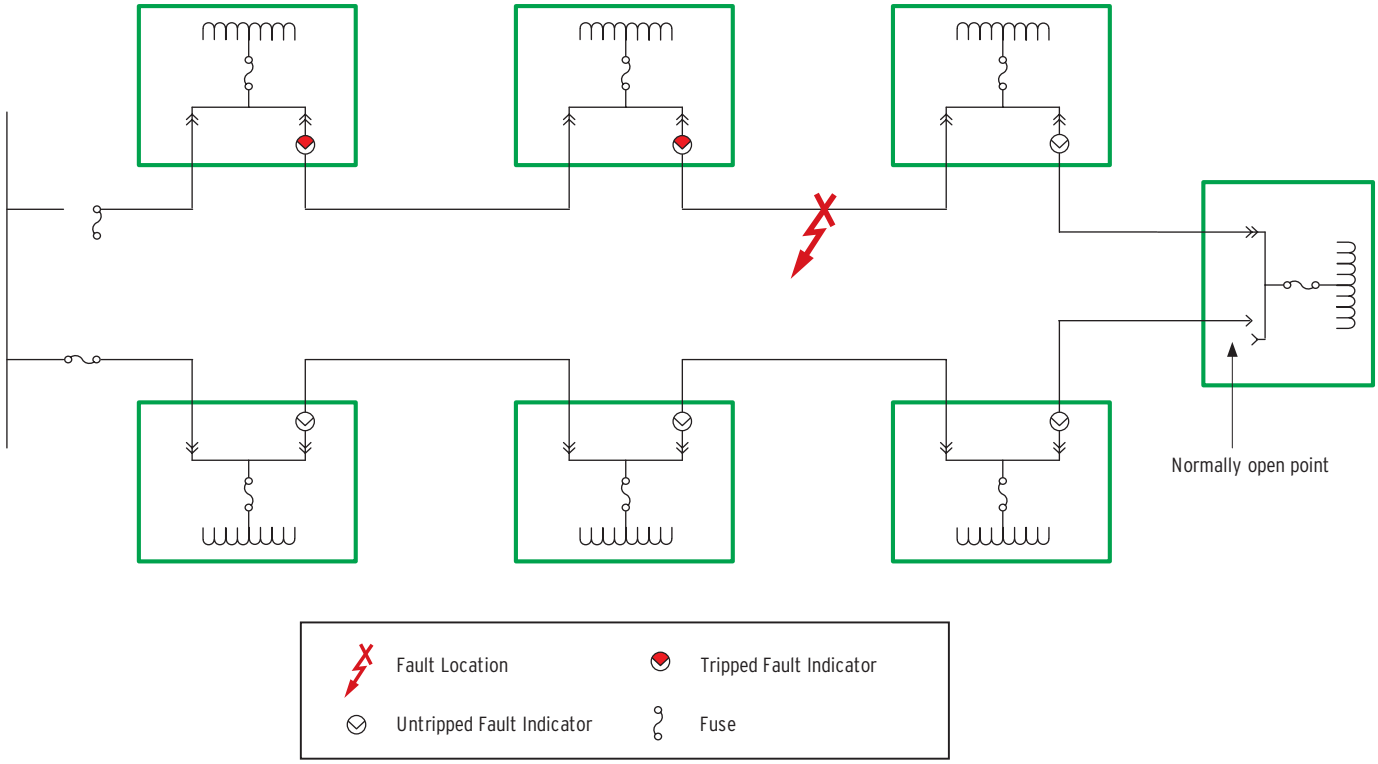
*Three-Phase "3" Display (BEACON versions also available)*

*Large "L" Display (BEACON versions also available)*

*RadioRANGER™ Remote Fault Reader (8310) Display*

# Applying SEL Fault Indicators

SEL fault indicators sense the magnetic field produced by current flowing through a conductor. When fault current passes through the fault indicator, the fault indicator "trips," indicating a fault. Because SEL offers a variety of fault indicator displays, the trip might be indicated by a reflective target, flashing light, or combination of the two display types. The Tamperproof Bolt Display, read by a compass-like tool, and RadioRANGER™ Remote Fault Reader provide other display options.




*Line crews find the location of faults by isolating the section of line between the last tripped (red) fault indicator and the first untripped (white) fault indicator.*

### Underground

In underground applications, a utility usually places a fault indicator on each primary cable. If a fault causes a feeder fuse to operate, the indicators upstream of the fault trip, and the indicators after the fault remain in the untripped position. As a result, the utility can easily identify the faulted section of cable without going through a time-consuming re-fuse and sectionalize process.

Underground applications include subsurface or pad-mounted transformers, subsurface or pad-mounted switchgear and sectionalizing cabinets, junction boxes, and splices. An auxiliary contact option provides SCADA compatibility.

The RadioRANGER Wireless Fault Indication System, designed for underground vault applications, uses radio frequency to communicate fault status to a handheld Remote Fault Reader (see page 20).

### Overhead

When a fault occurs on an overhead system, the easy-to-spot displays on the SEL fault indicators lead the line crew to the faulted section of line.

Overhead applications include unfused taps, long feeders with midline reclosers or sectionalizers, overhead-to-underground transitions, and feeders that experience recurring faults.

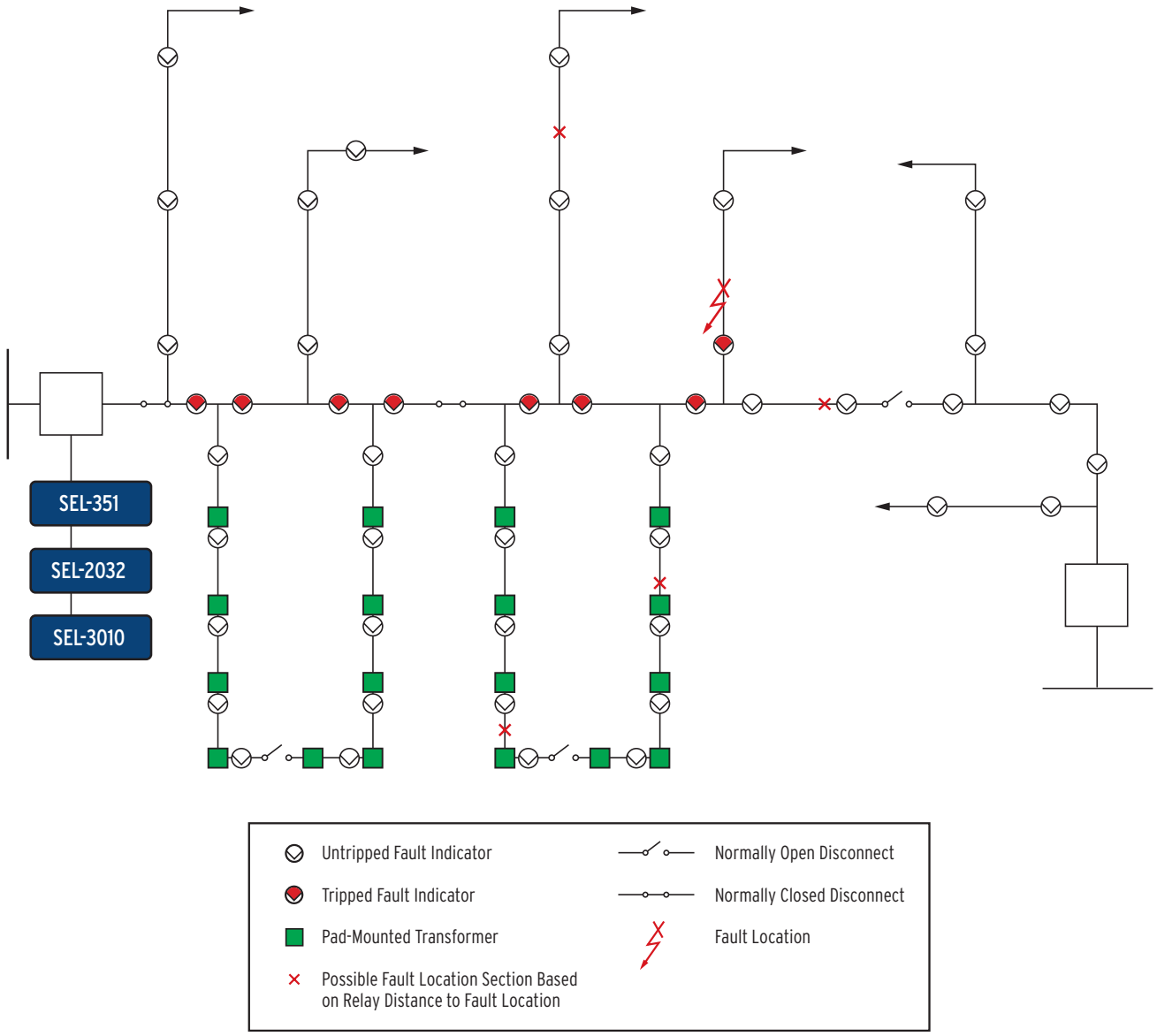
Applying fault counters and timed reset fault indicators in areas affected by momentary outages and flickering lights is an efficient means of identifying the location of temporary faults. This application of fault indicators, designed to locate temporary faults, provides utilities with the information to resolve these disruptions. Using fault indicators as a tool reduces costs to utilities and their customers and improves utilities' reliability indices.

# Applying Fault Indicators With Other SEL Products

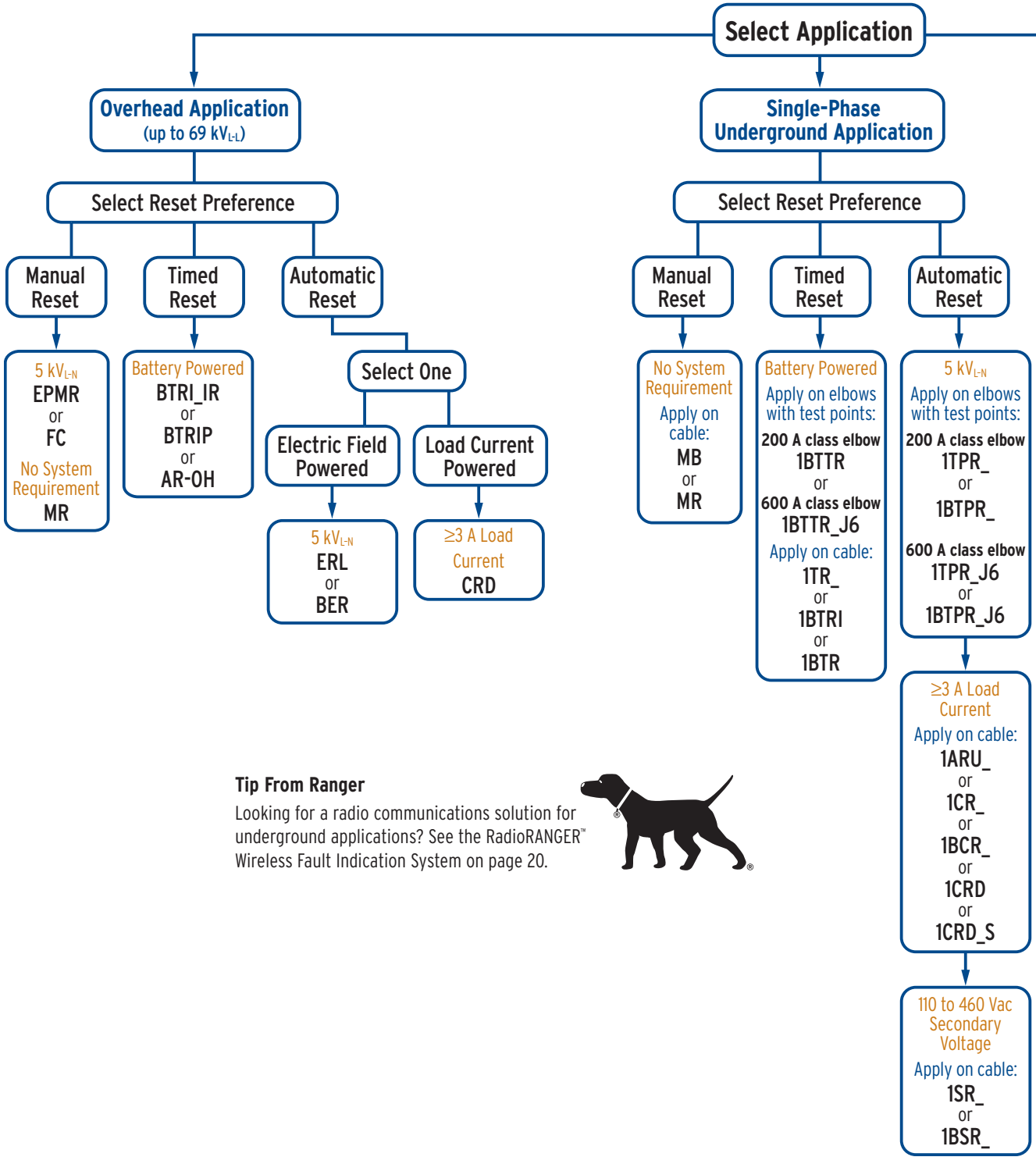
Use SEL fault indicators and distribution protection equipment together to identify the location of a fault.

When a fault occurs, the SEL feeder relay calculates the fault location as a distance from the substation to the fault, information that could be communicated to a lineman's cell phone via the SEL-3010 Event Messenger. When a feeder has multiple taps, as shown in the diagram below, the line crew is unable to determine which tap to follow to find the location of the fault. SEL fault indicators provide a solution by pointing the way to the correct tap, then to the faulted section of line.

*SEL-351 Directional Overcurrent and Reclosing Relay.*



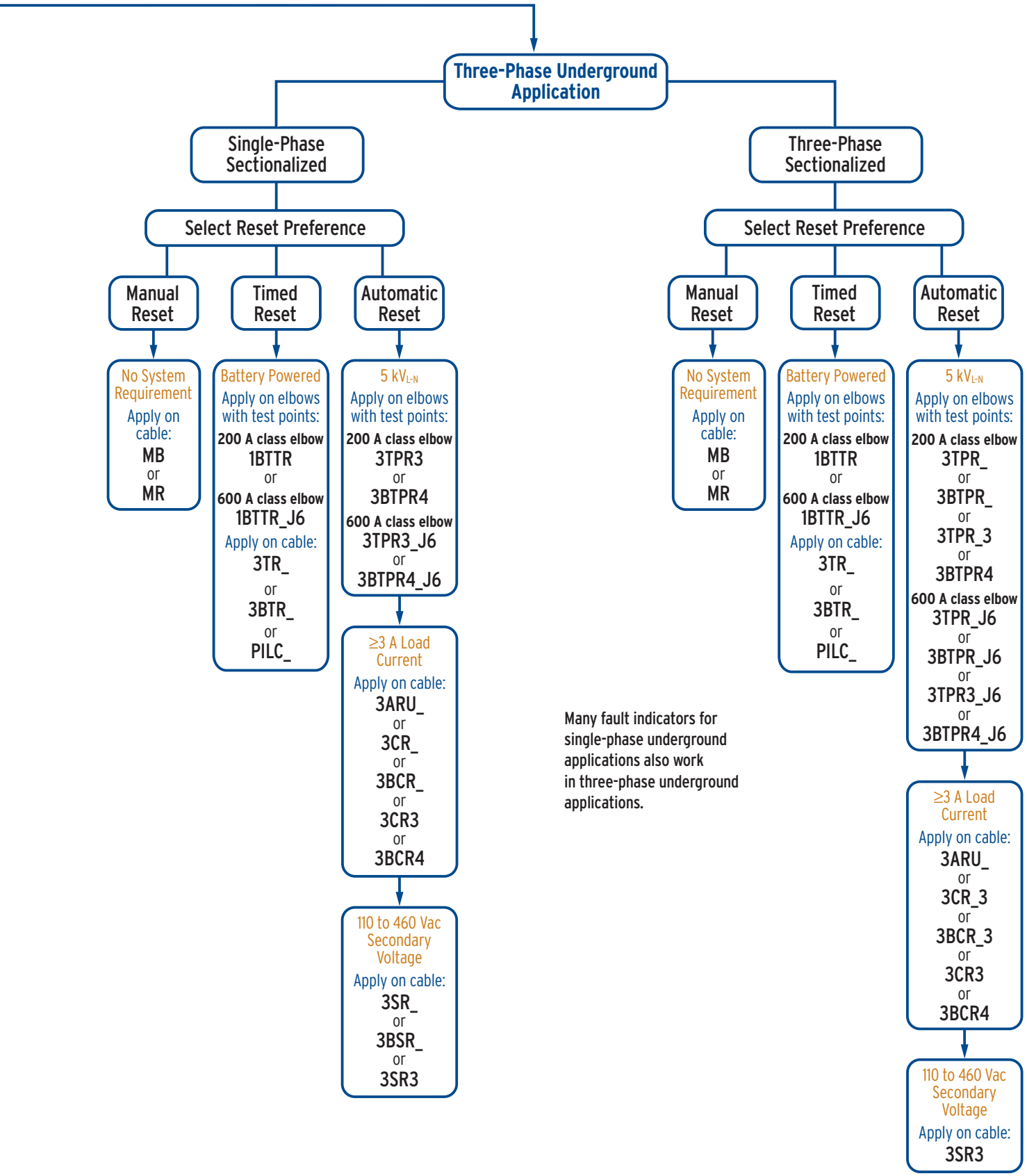
# SEL Fault Indicator Selection Guide




**Tip From Ranger**

Looking for a radio communications solution for underground applications? See the RadioRANGER™ Wireless Fault Indication System on page 20.

# SEL Fault Indicator Selection Guide




Many fault indicators for single-phase underground applications also work in three-phase underground applications.

# Overhead Fault Indicator Feature Table

| Overhead Fault Indicators | Manual Reset | | Electrostatic Reset | | Current Reset | Timed Reset | | |
|---|---|---|---|---|---|---|---|---|
| | MR | FC | ERL† | BER | CRD | BTRI_IR | AR-OH | BTRIP |
| **APPLICATION** | | | | | | | | |
| Single-Phase | • | • | • | • | • | • | • | • |
| Three-Phase (Use 3 Single-Phase FCIs) | • | • | • | • | • | • | • | • |
| Troubleshooting | • | • | | | | • | • | • |
| Also Applicable Underground | • | | • | | • | | | |
| **RESET TYPE** | | | | | | | | |
| Manual Reset | • | • | | | | | | |
| Electrostatic Reset | | | • | • | | | | |
| Current Reset | | | | | • | | | |
| Timed Reset | | | | | | • | • | • |
| **DISPLAY OPTIONS** | | | | | | | | |
| Integral Target | • | | • | • | • | | | |
| Integral Pointer | | • | | | | | | |
| Integral LED(s) | | | | • | | • | • | • |
| **STANDARD FEATURES** | | | | | | | | |
| Inrush Restraint | | • | • | • | • | • | • | • |
| Undelayed Trip (1 ms) | | • | • | • | • | • | | |
| Undelayed Trip (8 ms) | • | | | | | | | |
| Delayed Trip (24 ms) | | | | | | | • | • |
| Replaceable Lithium AA Cell | | | | • | | • | | |
| Nonreplaceable Lithium C Cell | | | | | | | • | • |
| Daylight Restraint® | | | | • | | | | |
| **AVAILABLE OPTIONS*** | | | | | | | | |
| Delayed Trip (24 ms) | | • | • | • | • | • | | |
| Nonreplaceable Lithium C Cell | | | | • | | • | | |
| Constant Calibration | | | • | • | | | | |
| **TRIP RATINGS** | | | | | | | | |
| Self-Adjusting (50 to 1200 A) | | | | | | | • | |
| Field-Programmable (50 to 1200 A) | | | | | | | | • |
| 100 to 800 A | • | | | | | | | |
| 50 to 1000 A | | • | | | | | | |
| 50 to 1200 A | | | • | • | | • | | |
| 100 to 1200 A | | | | | • | | | |
| **POWER SOURCE** | | | | | | | | |
| Fault-Powered | • | | | | | | | |
| Line-Powered | | • | • | • | • | | | |
| Battery | | | | • | | • | • | • |
| **ARMING REQUIREMENTS (MAINTAIN READINESS TO TRIP)** | | | | | | | | |
| No Arming Requirement | • | | | | | | | |
| 5 $kV_{L-N}$ Continuous | | • | • | • | | • | | |
| 3 A Continuous | | | | | • | | | |
| 2.4 $kV_{L-N}$ and 10 A Continuous Load Current | | | | | | | • | • |
| **RESET REQUIREMENTS** | | | | | | | | |
| Human Intervention | • | • | | | | | | |
| 5 $kV_{L-N}$ | | | • | • | | | | |
| 3 A | | | | | • | | | |
| Time | | | | | | • | • | • |
| **OUTER DIAMETER CLAMPING RANGE (SPECIFY CABLE OUTER DIAMETER WHEN ORDERING)** | | | | | | | | |
| 0.25" to 1.60" | • | • | • | • | | • | | |
| 0.30" to 1.10" | | | | | • | | | |
| 0.30" to 1.50" | | | | | | | • | • |
| **SYSTEM VOLTAGE RANGE** | | | | | | | | |
| Up to 38 $kV_{L-L}$ | • | • | | | • | | | |
| 8660 $V_{L-L}$ to 69 $kV_{L-L}$ | | | • | • | | • | | |
| 4160 $V_{L-L}$ to 69 $kV_{L-L}$ | | | | | | | • | • |

* *Not all options are available on all models of a product family.*

† *Specify the snap-action clamp when applying the ERL on live-front switchgear lugs in underground applications.*

# AR-OH—Overhead AutoRANGER™

*Self-adjusting fault indicator for system-wide application—one long-life product for all system loads.*

## Key Features

- Reduce engineering time, inventory, and misapplication with self-adjusting trip levels.
- Automatically adjusts its trip value based on the load current, eliminating the need to specify a trip value.
- Distinct temporary (amber) and permanent (red) fault indications provide the flexibility of tracking down self-clearing faults.
- The inrush restraint feature allows for coordinated integration with automatic reclosing schemes.
- Intelligent LED display provides the appropriate level of intensity for ambient lighting conditions.
- The best battery-saving technology in the industry provides more than 2,500 flashing hours of operation.
- Patented Ramp-Down Restraint® feature prevents false activation after extended circuit lockout.
- Rugged construction ensures long product life.
- Quick, simple installation.
  - Installs with a single hot stick—no extra clamps or screws
  - Zero maintenance
  - Test and manually reset with the CRSRTT tool

| Specifications | |
|---|---|
| Trip Value Range | 50 to 1200 A |
| System Voltage Range (L-L) | 4160 V to 69 kV |
| Maximum Fault Current | 25 kA for 10 cycles |
| Trip Response Time | 24 ms |
| Permanent Flash Clearing Times | |
| 50 and 100 A Trip Levels | 8 hours |
| 200 to 1200 A Trip Levels | 4 hours |
| Temporary Flash Clearing Time | 8 hours |
| Outer Diameter Clamping Range | 0.30" to 1.50" |
| Battery | 3.6 V high-capacity 8.5 Ah lithium battery with a 20-year shelf life |
| Flash Life | 2500+ hours (625 four-hour events) |
| Temperature Range | −40° to +85°C |
| Approximate Weight | 575 g (1.27 lbs) |

## Applications

### Overhead

- Provides clear visual indication of the fault path to line crews in the field.
- Reduces fault-locating time by guiding line crews to the faulted line section.
- Allows line crews to easily distinguish between temporary and permanent faults.
- Provides a simple, economical way to improve utility reliability metrics by reducing outage durations.

### Rural

- Automatic trip value selection as low as 50 A.
- TR(TV)™ feature (Timed Reset as a function of Trip Value) allows additional time for line crews to find faults on remote lines.

### Troubleshooting

- Distinct eight-hour temporary indication leads line crews to troubleshoot problematic sections of line.
- Allows line crews to investigate the cause of self-clearing faults and successful trip and reclose operations to improve circuit reliability.

*Use the CRSRTT tool (sold separately) to field-test and manually reset the Overhead AutoRANGER®.*

*AutoRANGER® Fault Indicators providing fault indication in Kodiak, Alaska.*

*Install the AutoRANGER® with a single hot stick.*

# AutoRANGER™ Field Guide

## Application Overview

The AutoRANGER is a self-adjusting fault indicator. It automatically selects one of eight discrete trip values based on the sampled load current of the circuit to which it is applied.

| Load Current Range | Trip Value |
|---|---|
| 10 A < I < 25 A | 50 |
| 25 A < I < 50 A | 100 |
| 50 A < I < 100 A | 200 |
| 100 A < I < 200 A | 400 |
| 200 A < I < 300 A | 600 |
| 300 A < I < 400 A | 800 |
| 400 A < I < 500 A | 1000 |
| 500 A < I | 1200 |

Note: The AutoRANGER is applicable on circuits with less than 10 A of nominal load; however, there will be a few minutes of unavailability upon installation or after a reset to verify energized line conditions. In addition, the unit will not enter the temporary fault display mode (see Display Modes) because it cannot discriminate between temporary and permanent faults under this loading condition. Please contact E. O. Schweitzer Manufacturing for further details.

## Display Modes

By checking circuit conditions after a fault, the AutoRANGER distinguishes between temporary (self-clearing) and permanent faults. It then displays each fault type uniquely.

**Temporary Faults**

The AutoRANGER indicates a temporary fault by flashing a single, forward-facing amber LED for eight hours.

**Permanent Faults**

The AutoRANGER's two forward-facing red LEDs indicate a permanent fault. However, the flashing duration for a permanent fault depends on the prefault load: the AutoRANGER varies the duration of its permanent fault indication to allow more time for a line crew to patrol lightly loaded circuits (typically located in remote areas of a utility's system).

| Fault Mode | Prefault Load | Flashing Duration | LED Color |
|---|---|---|---|
| Temporary | I < 50 A | 8 hrs | Amber |
| | I > 50 A | | |
| Permanent | I < 50 A | 8 hrs | Red |
| | I > 50 A | 4 hrs | |

Cut here to use in the field.


Tel: +1.847.362.8304 | Fax: +1.847.362.8396 | www.eosmfg.com

In addition to distinct display modes for permanent and temporary faults, the AutoRANGER also uses different display modes for daytime and nighttime conditions based on ambient light measurement. While daytime mode produces full intensity from the forward-facing LEDs, a user should be directly underneath the indicator to examine the display. When the AutoRANGER is in permanent mode during dark ambient lighting conditions, two internal red LEDs also activate to illuminate the indicator's translucent housing. This allows line crews to see the AutoRANGER at night from 360 degrees at distances greater than 1,000 feet.

## Fault Indication Modes

Any overcurrent condition above the self-adjusted threshold, sustained for more than 24 ms, will cause the AutoRANGER to enter the red permanent fault display mode. Two minutes after the fault, the indicator will check for system voltage and current, and make one of three decisions:

| | |
|---|---|
| **New Sustained Load** | If the overcurrent condition is actually a new, higher-sustained load, the indicator exits the permanent fault display mode and self-adjusts to the appropriate trip level. |
| **Temporary Fault** | An energized circuit with "nominal" current signifies a self-clearing fault or a successful trip and reclose operation: the unit switches to the temporary fault display mode for an additional eight hours. Indicators that are in the temporary fault mode will reset anytime the circuit is de-energized. This ensures that a new fault is given priority over an older, temporary fault. |
| **Permanent Fault** | A de-energized circuit signifies a circuit lockout: the indicator will remain in the permanent fault display mode for 4 or 8 hours, depending on prefault load (see table on page 10). |

## Inrush Restraint

Fault indicators applied on circuits with reclosing schemes should be immune to inrush currents occurring during reclose attempts. Otherwise, the reclosing operations could falsely trip indicators installed on unfaulted line sections. To properly restrain from tripping on inrush current, the AutoRANGER does not respond to any overcurrent for a minimum of five minutes after a reclosing operation. The maximum inrush restraint time is the duration of the circuit outage plus two minutes. Do not install AutoRANGER fault indicators on a dead circuit to detect a fault on a reclose attempt.

## Reset and Test

Because the AutoRANGER is a true timed-reset fault indicator, it provides security against false reset from backfeed currents or voltage fields from overbuilt/underbuilt systems. To manually reset the AutoRANGER with the CRSRTT tool, simply apply the magnet tool directly over the AutoRANGER logo on the front of the indicator for approximately five seconds. Use the same procedure to test the indicator's battery integrity: doing so will activate an untripped indicator's LEDs in a flashing test pattern.

✂ Cut here to use in the field.

# BTRIP—BEACON™ Field-Programmable Timed Reset

*Select your trip value in the field. Stock one fault indicator for a variety of system conditions.*

## Key Features

- Indicator's trip value is field-selectable based on circuit load and available fault current—stock one fault indicator for a variety of system conditions.
- Provides clear visual indication of the fault path to line crews in the field.
- Reduces fault-locating time by guiding line crews to the faulted line section.
- Provides a simple, economical way to improve utility reliability metrics by reducing outage durations.
- Inrush restraint feature allows for coordinated integration with automatic reclosing schemes, preventing false tripping.
- Rugged construction ensures long product life.
- Quick, simple installation.
  - Installs with a single hot stick—no extra clamps or screws
  - Zero maintenance
  - Test and manually reset with the CRSRTT tool

| Specifications | |
|---|---|
| Trip Value Range | Select a set of four defined values between 50 A and 1200 A (see ordering table on page 17) |
| System Voltage Range (L-L) | 4160 V to 69 kV |
| Maximum Fault Current | 25 kA for 10 cycles |
| Trip Response Time | 24 ms |
| Reset Time | 4 or 8 hours (specify when ordering) |
| Outer Diameter Clamping Range | 0.30" to 1.50" |
| Battery | 3.6 V high-capacity 8.5 Ah lithium battery with a 20-year shelf life |
| Flash Life | 2100+ hours |
| Temperature Range | –40° to +85°C |
| Approximate Weight | 575 g (1.27 lbs) |

*Use the CRSRTT tool (included) to program, field-test, and manually reset the BTRIP.*

*BTRIP Fault Indicators provide the flexibility of field-selectable trip value.*

*The BTRIP's simple, strong clamp is easy to install on overhead lines.*

# BTRI_IR—BEACON™ Timed Reset

*Economical timed reset fault indicator eliminates false reset concerns.*

## Key Features

- Applicable on overhead taps, overhead-to-underground transitions, and at overhead midfeeder disconnects.
- No minimum load current necessary for reset.
- Permanently installed high-capacity lithium battery provides an average of 3,000 flashing hours (1,200 for models with a replaceable battery, shown in the photo above).
- Time delay between system restoration and reset makes the BTRI_IR a good choice for troubleshooting temporary faults.
- Inrush restraint feature allows for coordinated integration with automatic reclosing schemes, preventing false tripping.

| Specifications | |
|---|---|
| Power Source | High-capacity 3.6 V lithium battery |
| Replaceable Battery | 1200-hour flashing life (2.4 Ah cell) |
| Nonreplaceable Battery | 3000-hour flashing life (8.5 Ah cell) |
| Nominal Trip Ratings | 50 to 1200 A |
| Trip Tolerance | ±10% |
| System Voltage Range (L-L) | 8660 V to 38 kV |
| Maximum Fault Current | 25 kA for 10 cycles at 60 Hz |
| Display | Flashing red LED with a 4- or 8-hour clearing time |
| Outer Diameter Clamping Range | 0.25" to 1.6" (please specify clamping diameter or range when ordering) |
| Housing Material | UV-stabilized polycarbonate resin |
| Clamp Material | Stainless-steel clamp with a UV-stabilized rubber sleeve |
| Temperature Range | –40° to +85°C |
| Approximate Weight | 400 g (0.88 lbs) |

*Use the CRSRTT tool (sold separately) to field-test and manually reset the BTRI_IR.*

*BTRI_IR Fault Indicators installed on an overhead system.*

*Install the BTRI_IR in applications susceptible to temporary faults.*

# ERL—Electrostatic Reset

*Battery-free automatic reset fault indicator provides maintenance-free fault indication.*

## Key Features

- Automatically resets upon restoration of system voltage.
- Apply at strategic intervals along overhead conductors and at midfeeder disconnects to minimize fault-finding time and optimize reliability statistics.
- Inrush restraint feature prevents false tripping during recloser operations.
- The reflective red target (the largest display in the industry) is easy to spot both at night and during the day.
- Zero maintenance: no battery to replace or monitor.
- Models with the snap-action clamp option are applicable on live-front switchgear—simply install the ERL onto the barrel of the cable termination lug.

| Specifications | |
|---|---|
| Power Source | Electric field potential gradient |
| Nominal Trip Ratings | 50 to 1200 A |
| Trip Tolerance | ±10% |
| System Voltage Range (L-L) | 8660 V to 69 kV |
| Reset Time | Approximately 5 minutes at 5 $kV_{L-N}$ (higher voltages result in quicker reset) |
| Display | Reflective red target |
| Maximum Fault Current | 25 kA for 10 cycles at 60 Hz |
| Trip Response Time | 1 ms |
| Inrush Restraint Response Time | 300 ms |
| Outer Diameter Clamping Range | 0.25" to 1.6" (please specify clamping diameter or range when ordering) |
| Housing Material | UV-stabilized polycarbonate resin |
| Clamp Material | Stainless-steel clamp with a UV-stabilized rubber sleeve |
| Temperature Range | –40° to +85°C |
| Approximate Weight | 240 g (0.53 lbs) |

*Side view of the ERL.*

*The ERL, SEL's best-selling overhead fault indicator, automatically resets upon system restoration.*

# BER—BEACON™ Electrostatic Reset

*Combination LED and target display provides optimal night and day indications, and maximizes battery life.*

## Key Features

- Dual-display FCI incorporates an LED with a reflective red mechanical target (the largest in the industry) to provide excellent visual indication, even in low light conditions.
- 1,200 flashing hours standard; 3,000 flashing hours with the non-replaceable battery.
- The mechanical target continues to provide indication regardless of battery status.
- Automatic reset upon restoration of system voltage.
- Daylight Restraint® conserves battery life by activating the LED only in reduced ambient light conditions.
- Apply at strategic intervals along overhead conductors and at midfeeder disconnects to minimize fault-finding time and optimize reliability statistics.
- Inrush restraint feature prevents false tripping during recloser operations.

| Specifications | |
|---|---|
| Power Source | Electric field potential gradient |
| Nominal Trip Ratings | 50 to 1200 A |
| Trip Tolerance | ±10% |
| System Voltage Range (L-L) | 8660 V to 69 kV |
| Reset Time | Approximately 5 minutes at 5 $kV_{L-N}$ (higher voltages result in quicker reset) |
| Display | Reflective red target with LED |
| Maximum Fault Current | 25 kA for 10 cycles at 60 Hz |
| Trip Response Time | 1 ms |
| Inrush Restraint Response Time | 300 ms |
| Outer Diameter Clamping Range | 0.25" to 1.6" (please specify clamping diameter or range when ordering) |
| Battery | 3.6 V high-capacity lithium battery with a 20-year shelf life |
| Flash Life | 1200+ hours standard (replaceable 2.4 Ah cell); 3000+ hours (nonreplaceable 8.5 Ah cell) |
| Housing Material | UV-stabilized polycarbonate resin |
| Clamp Material | Stainless-steel clamp with a UV-stabilized rubber sleeve |
| Temperature Range | –40° to +85°C |
| Approximate Weight | 390 g (0.86 lbs) |

*The BER Fault Indicator provides excellent fault indication at night because of its high-intensity LED display.*

# CRD — Current Reset

*Load current-powered FCI with no minimum voltage requirement provides a solution for low-voltage applications.*

## Key Features

- Load current-powered—no battery necessary.
- No minimum voltage requirement.
- Automatically resets upon restoration of load current.
- Inrush restraint feature prevents false tripping during recloser operations.
- Maintains trip tolerance throughout the clamping range.
- Easy to install with a single hot stick.
- UV-stabilized materials provide excellent weatherability.

| Specifications | |
|---|---|
| Power Source | Load current |
| Nominal Trip Ratings | 100 to 1200 A |
| Trip Tolerance | ±10% |
| System Voltage Range (L-L) | Up to 38 kV |
| Reset Time | 25 seconds at 3 A |
| Reset Current | 3 A |
| Maximum Fault Current | 25 kA for 10 cycles |
| Trip Response Time | 1 ms |
| Inrush Restraint Response Time | 300 ms |
| Outer Diameter Clamping Range | 0.3" to 1.1" (please specify clamping diameter or range when ordering) |
| Housing Material | UV-stabilized polycarbonate resin |
| Transformer Core | Silicon steel with vinyl coating |
| Temperature Range | −40° to +85°C |
| Approximate Weight | 510 g (1.12 lbs) |

*The CRD Fault Indicator is easy to install on an overhead line using a single hot stick.*

*CRDs provide fault indication in a low-voltage application.*

# Overhead Fault Indicator Ordering Tables

## Instructions for Creating Overhead Fault Indicator Part Numbers

1. Select one code (in bold) from each column (i.e., B, TRI, P3, etc.). For the Overhead BEACON™ Timed Reset, both options can be selected from the Options column. List option codes in the order that they appear in the column.*
2. Follow your usual process to issue a purchase order, or complete a specification for standards.

**Example Part Numbers**

AR4–OH

BTRI0300IR4DT

### Overhead AutoRANGER™

| AutoRANGER | Nominal Time-Out Period | Overhead Designation |
|---|---|---|
| **AR** | **4** 4 hrs<br>**8** 8 hrs | **–OH** |

*Other time-out periods may be available for your application. For details, please email E. O. Schweitzer Manufacturing Customer Service at sales@eosmfg.com or call +1.847.362.8304.*

### Overhead BEACON Field-Programmable Timed Reset

| BEACON LED | Timed Reset Designation | Programmable Trip Level Options | Trip Level Set at Shipment | Inrush Restraint | Time-Out Period |
|---|---|---|---|---|---|
| **B** | **TRI** | **P1** (100, 200, 400, 800 A)<br>**P2** (200, 600, 800, 1200 A)<br>**P3** (400, 600, 800, 1000 A)<br>**P4** (600, 800, 1000, 1200 A)<br>**P5** (50, 100, 200, 400 A) | **S1** Setting 1<br>**S2** Setting 2<br>**S3** Setting 3<br>**S4** Setting 4 | **IR** | **4** 4 hrs<br>**8** 8 hrs<br>**16** 16 hrs<br>**24** 24 hrs |

### Overhead BEACON Timed Reset

| BEACON Timed Reset Designation | Trip Level | Inrush Restraint | Time-Out Period | Options |
|---|---|---|---|---|
| **BTRI** | **0050** 50 A<br>**0100** 100 A<br>**0200** 200 A<br>**0300** 300 A<br>**0400** 400 A<br>**0600** 600 A<br>**0800** 800 A<br>**1000** 1000 A<br>**1200** 1200 A | **IR** | **2** 2 hrs<br>**4** 4 hrs<br>**8** 8 hrs<br>**M** Manual reset | **–** No options<br>**DT** Delayed trip (24 ms)<br>**N** Nonreplaceable battery |

### Overhead Electrostatic Reset

| Electrostatic Reset Designation | Trip Level | Inrush Restraint | Options |
|---|---|---|---|
| **ERL** | **0050** 50 A<br>**0100** 100 A<br>**0200** 200 A<br>**0300** 300 A<br>**0400** 400 A<br>**0600** 600 A<br>**0800** 800 A<br>**1000** 1000 A<br>**1200** 1200 A | **IR** | **–** No options<br>**DT** Delayed trip (24 ms) |

### Overhead BEACON Electrostatic Reset

| BEACON Electrostatic Reset Designation | Trip Level | Inrush Restraint | Options |
|---|---|---|---|
| **BER** | **0050** 50 A<br>**0100** 100 A<br>**0200** 200 A<br>**0300** 300 A<br>**0400** 400 A<br>**0600** 600 A<br>**0800** 800 A<br>**1000** 1000 A<br>**1200** 1200 A | **IR** | **–** No options<br>**DT** Delayed trip (24 ms)<br>**N** Nonreplaceable battery |

### Overhead Current Reset

| Current Reset Designation | Large Integral Display | Trip Level | Inrush Restraint | Options |
|---|---|---|---|---|
| **CR** | **D** | **0100** 100 A<br>**0200** 200 A<br>**0300** 300 A<br>**0400** 400 A<br>**0600** 600 A<br>**0800** 800 A<br>**1000** 1000 A<br>**1200** 1200 A | **IR** | **–** No options<br>**DT** Delayed trip (24 ms) |

* Consult E. O. Schweitzer Manufacturing if you are preparing to order a part number you have not ordered before.

## Underground Fault Indicator Feature Table

| | Manual Reset Fault Indicators | | Voltage Reset Faulted Circuit Indicators | | | | | | | | | | | PILC Family |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Test Point Voltage Reset Family | | | | | Secondary Voltage Reset Family | | | | | |
| | MR | MB | ERL† | TPRI | TPRV | TPRL | TPRB | TPR3 | SRI | SRV | SRL | SRB | SR3 | |
| **APPLICATION** | | | | | | | | | | | | | | |
| Single-Phase | ● | ● | ● | ● | ● | ● | ● | | ● | ● | ● | ● | | |
| Three-Phase | + | + | + | + | ● | ● | ● | ● | + | ● | ● | ● | ● | ● |
| Troubleshooting | ● | ● | | | | | | | | | | | | |
| Three-Phase Reset | | | | | | | | ● | | | | | ● | |
| **RESET TYPE** | | | | | | | | | | | | | | |
| Manual Reset | ● | ● | | | | | | | | | | | | |
| Electrostatic Reset | | | ● | | | | | | | | | | | |
| Test Point Voltage Reset | | | | ● | ● | ● | ● | ● | | | | | | |
| Secondary Voltage Reset | | | | | | | | | ● | ● | ● | ● | ● | |
| Current Reset | | | | | | | | | | | | | | |
| Timed Reset | | | | | | | | | | | | | | ● |
| **DISPLAY OPTIONS** | | | | | | | | | | | | | | |
| Integral Target | ● | ● | ● | ● | | | | | ● | | | | | |
| Remote Target | | | | | ● | ● | | | | ● | ● | | | ● |
| Integral LED | | | | | | | | | | | | | | |
| Remote LED | | | | | | | B | | | | | B | | |
| Remote Target With LED | | | | | B | B | | | | B | B | | | |
| Three-Phase Target | | | | | | | | ● | | | | | ● | |
| Three-Phase Target With LED | | | | | | | | 4 | | | | | | |
| Tamperproof Bolt Display | | | | | | | ● | | | | | ● | | |
| RadioRANGER® Magnetic Probe | | | | | | | | | | | | | | ● |
| **STANDARD FEATURES** | | | | | | | | | | | | | | |
| Undelayed Trip (1 ms) | | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | |
| Undelayed Trip (8 ms) | ● | ● | | | | | | | | | | | | |
| Delayed Trip Response Time | | | | | | | | | | | | | | |
| Replaceable Lithium AA Cell | | | | | | | | | | | | | | |
| Nonreplaceable Lithium C Cell | | | | | | | | | | | | | | |
| Inrush Restraint | | | ● | | | | | | | | | | | |
| Discrete Time-Current Curve | | | | | | | | | | | | | | ● |
| **OPTIONAL FEATURES*** | | | | | | | | | | | | | | |
| Inrush Restraint | | | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | |
| Auxiliary Contact | | | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | |
| Window Mounting Kit | | | | | | ● | | | | | ● | | | |
| Delayed Trip (24 ms) | | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | |
| Snap-Action Clamp | | | ● | | | | | | | | | | | |
| Nonreplaceable Lithium C Cell | | | | | | | | | | | | | | |
| Junction Shield | | | | ● | ● | ● | ● | ● | | | | | | |
| Constant Calibration | | | ● | | | | | | | | | | | |
| Test Point Phase Sensor | | | | ● | ● | ● | ● | ● | | | | | | |
| **TRIP RATINGS** | | | | | | | | | | | | | | |
| 25 to 800 A | | ● | | | | | | | | | | | | |
| 50 to 1000 A | | | | | | | | | ● | ● | ● | ● | ● | |
| 50 to 1200 A | | | ● | | | | | | | | | | | |
| 60 to 1200 A | | | | ● | ● | ● | ● | ● | | | | | | |
| 100 to 800 A | ● | | | | | | | | | | | | | |
| 100 to 1200 A | | | | | | | | | | | | | | |
| 600 to 1200 A | | | | | | | | | | | | | | ● |
| Self-Adjusting (50 A to 1200 A) | | | | | | | | | | | | | | |
| **POWER SOURCE** | | | | | | | | | | | | | | |
| Line-Powered | | | ● | ● | ● | ● | ● | ● | | | | | | |
| Secondary Source | | | | | | | | | ● | ● | ● | ● | ● | |
| Battery | | | | | B | B | B | B | | B | B | B | | ● |
| **ARMING REQUIREMENTS (MAINTAIN READINESS TO TRIP)** | | | | | | | | | | | | | | |
| No Arming Requirement | ● | ● | | | | | | | | | | | | ● |
| 5000 $V_{L-N}$ | | | ● | ● | ● | ● | ● | ● | | | | | | |
| 110 to 460 Vac | | | | | | | | | ● | ● | ● | ● | ● | |
| 3 A [LC] | | | | | | | | | | | | | | |
| **RESET REQUIREMENTS** | | | | | | | | | | | | | | |
| Human Intervention | ● | ● | | | | | | | | | | | | |
| 5000 $V_{L-N}$ Continuous | | | ● | ● | ● | ● | ● | ● | | | | | | |
| 110 to 460 Vac | | | | | | | | | ● | ● | ● | ● | ● | |
| 3 A Continuous [LC] | | | | | | | | | | | | | | |
| Time | | | | | | | | | | | | | | ● |
| **OUTER DIAMETER CLAMPING RANGE (SPECIFY CABLE OUTER DIAMETER WHEN ORDERING)** | | | | | | | | | | | | | | |
| 0.25" to 1.60" | ● | | ● | | | | | | | | | | | |
| 0.25" to 1.40" | | ● | | | | | | | | | | | | |
| 0.75" to 1.60" | | | | | | | | | ● | ● | ● | ● | ● | |
| 0.75" to 2.10" | | | | | | | | | | | | | | |
| 2.2" to 2.8" | | | | | | | | | | | | | | ● |
| Larger Clamp Options | C | C | | | | | | | C | C | C | C | C | |
| **SYSTEM VOLTAGE RANGE** | | | | | | | | | | | | | | |
| Up to 35.5 $kV_{L-L}$ | ● | ● | | | | | | | | | | | | |
| Matches Shielded URD Cable Rating | | | | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| 8660 $V_{L-L}$ to 34.5 $kV_{L-L}$ | | | ● | | | | | | | | | | | |

3 *Option is available when selecting the 3 suffix (three-phase reset)*

4 *Reflective red targets with a center BEACON® LED*

B *Option is available when selecting the B prefix (BEACON LED) in model selection*

T *Test point phase sensor*

C *Please consult factory*

* *Not all options are available on all models of a product family*

| Current Reset Faulted Circuit Indicators | | | | | | | | | | Timed Reset Fault Indicators | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Current Reset Family | | | | | Underground AutoRANGER™ Family | | | | | Timed Reset Family | | | | |
| CRI | CRV | CRL | CRB | CR3 | 1ARUI | 1ARUV | 1ARUL | 1ARUB | 3ARU3 | TRI | TRV | TRL | TRB | TR3 |
| | | | | | | | | | | | | | | |
| • | • | • | • | | • | • | • | • | | • | • | • | • | |
| + | • | • | • | • | + | + | + | + | • | + | • | • | • | • |
| | | | | | | | | | | • | • | • | • | • |
| | 3 | 3 | 3 | • | | | | | • | | | | | • |
| | | | | | | | | | | | | | | |
| | | | | | CATR | CATR | CATR | CATR | CATR | • | • | • | • | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| • | • | • | • | • | • | • | • | • | • | | | | | |
| | | | | | CATR | CATR | CATR | CATR | CATR | • | • | • | • | • |
| | | | | | | | | | | | | | | |
| • | | | | | • | | | | | • | | | | |
| | • | • | | | | • | • | | | | • | • | | |
| | | | | | | | | | | B | | | | |
| | | | B | | | | | B | | | | | B | |
| | B | B | | | | B | B | | | | B | B | | |
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| | | | | 4 | | | | | | | | | | |
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| | | | | | • | • | • | • | • | | | | | |
| | | | | | | | | | | | | | | |
| • | • | • | • | • | | | | | | | | | | |
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| • | • | • | • | • | | | | | | • | • | • | • | • |
| | | | | | | | | | | • | • | • | • | • |
| | | | | | | | | | | B | | | B | |
| | | | | | | | | | | | | | | |
| • | • | • | • | • | | | | | | | T | T | T | T |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | • | • | • | • | • |
| | | | | | | | | | | | T | T | T | T |
| | | | | | | | | | | | | | | |
| • | • | • | • | • | | | | | | | | | | |
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| | | | | | | | | | | | | | | |
| • | • | • | • | • | • | • | • | • | • | | | | | |
| | B | B | B | B | | B | B | B | | • | • | • | • | • |
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| | | | | | | | | | | | | | | |
| • | • | • | • | • | • | • | • | • | • | | | | | |
| | | | | | CATR | CATR | CATR | CATR | CATR | • | • | • | • | • |
| | | | | | | | | | | • | • | • | • | • |
| | | | | | | | | | | | | | | |
| • | • | • | • | • | • | • | • | • | • | | | | | |
| | | | | | | | | | | | | | | |
| C | C | C | C | C | C | C | C | C | C | C | C | C | C | C |
| | | | | | | | | | | | | | | |
| • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |

† *ERLs can only be installed on live-front switchgear lugs for URD applications*

LC *1.5 A if a Low Current Reset (LC) option is selected*

\+ *Use three single-phase FCIs*

CATR *Optional time delay reset*

- All BEACON displays are battery powered
- BEACON products are not available with an auxiliary contact ("A" option)

# RadioRANGER™ Wireless Fault Indication System

RADIORANGER®
WIRELESS FAULT INDICATION SYSTEM

## Let the RadioRANGER Wireless Fault Indication System point you to the underground fault location.

- Minimize fault-finding time and troubleshooting crew size. No need to open, enter, pump, or drain multiple vaults while blocking traffic.
- Improve line crew safety. Avoid leaving the truck and entering vaults in busy streets.
- Benefit from the proven reliability and quality record of SEL fault indicators.
- Choose from multiple SEL fault-indicator types to match your applications and system requirements.
- Display fault-path information on the handheld Remote Fault Reader.
- Maximize application efficiency using the modular and scalable system in a variety of vault configurations.
- Choose the PILC Fault Indicator for hard-to-troubleshoot, paper-insulated lead cables.

*Reduce fault-finding time in subsurface vault applications.*

*Communicate subsurface fault-indicator status to street-level personnel.*

**Also Applicable in Pad-Mounted Enclosures**

# RadioRANGER Wireless Fault Indication System

## Fault Indicators Compatible With the Wireless Interface

RadioRANGER Interface Probe

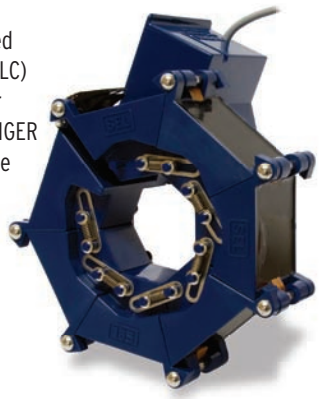
Underground AutoRANGER™ With RadioRANGER Interface Probe

Current Reset With RadioRANGER Interface Probe

Test Point Reset With RadioRANGER Interface Probe

Timed Reset With RadioRANGER Interface Probe

Paper-Insulated Lead Cable (PILC) Fault Indicator With RadioRANGER Interface Probe



## Key Features

- Simple street-level fault-indicator status retrieval eliminates the need for fault-finding crews to remove utility access covers and enter vaults.
- Multiple IDs allow the crew to easily identify the vault, way, and phase on which the fault occurred.
- IP68-rated Wireless Interface and waterproof interconnection system (rated to 15 feet submersion) ensure environmental integrity required for vault applications.
- Remote Fault Reader displays Wireless Interface system health and fault-indicator status.
- Vehicle accessory kit option maximizes the performance of the Remote Fault Reader in a vehicle.
- Two-way communications link prevents ambiguity by transmitting both tripped and reset fault-indicator information. Users can retrieve Wireless Interface and fault-indicator status at any time.

**Tip From Ranger**

For complete RadioRANGER features, applications, and specifications, visit **www.eosmfg.com/products/radio_ranger.html**

*SEL fault indicators equipped with magnetic RadioRANGER Interface Probes communicate their status to the Wireless Interface. Utility personnel can quickly retrieve subsurface FCI status at street level via the wireless communications link between the Wireless Interface and Remote Fault Reader. The RadioRANGER solution reduces the need to access vaults to retrieve FCI status, reducing fault-locating time and improving utility personnel safety.*

# RadioRANGER™ Wireless Fault Indication System

## Ordering Tables

Important: Please consult your independent sales representative or E. O. Schweitzer Manufacturing for assistance in selecting the best RadioRANGER model for your application.

**Definitions**

| Option Abbreviation | Option |
|---|---|
| L | Large core |
| IR | Inrush restraint |
| DT | Delayed trip |
| J | Junction shield |
| J6 | 600 A-class junction shield |

**Specifications**

| | |
|---|---|
| Power Source | |
| Wireless Interface (8300) | 3.6 V high-capacity lithium battery with 20-year shelf life |
| Remote Fault Reader (8310) | Three 1.5 V AA size cells |
| Wireless Interface Product Life | 15-plus years |
| Certifications | |
| FCC | 15.249 |
| IEC | RSS-210 |
| IP Rating | |
| Wireless Interface (8300) | IP68 |
| Remote Fault Reader (8310) | IP54 |
| Wireless Interface Submersibility | Up to 15 feet |
| Wireless Interface Temperature Range | –40° to +85°C (–40° to +185°F) |
| Fault Indicator Specifications | See individual fault indicator catalog pages |

### RadioRANGER Components

**Remote Fault Reader**

| Style | Model Number |
|---|---|
| Remote Fault Reader with integral antenna | SEL-8310 |

**Wireless Interface**

| Style | Model Number |
|---|---|
| Wireless Interface with integral antenna | SEL-8300 |
| Wireless Interface with remote antenna | SEL-8300A |

### Fault Indicators

**Underground AutoRANGER™**

| Model Number | RadioRANGER Magnetic Probe Designation | Current Activated Timed Reset Duration | | Options | Probe Lead Length Options | | Factory Code |
|---|---|---|---|---|---|---|---|
| 1ARU | M | 0 | 0 hrs | No options (leave blank) | G | 6 ft | Y2 |
| | | 2 | 2 hrs | L | P | 12 ft | |
| | | 4 | 4 hrs | | Q | 20 ft | |
| | | 8 | 8 hrs | | | | |
| | | 12 | 12 hrs | | | | |

**Test Point Reset**

| Model Number | RadioRANGER Magnetic Probe Designation | Nominal Trip Ratings | | Options | Probe Lead Length Options | |
|---|---|---|---|---|---|---|
| 1TPR | M | 0100 | 100 A | No options (leave blank) | G | 6 ft |
| | | 0200 | 200 A | IR | P | 12 ft |
| | | 0300 | 300 A | DT | Q | 20 ft |
| | | 0400 | 400 A | J | | |
| | | 0600 | 600 A | J6 | | |
| | | 0800 | 800 A | | | |
| | | 1000 | 1000 A | | | |
| | | 1200 | 1200 A | | | |

# RadioRANGER Wireless Fault Indication System

**Fault Indicators (continued)**

**Timed Reset (Clamp Style)**

| Model Number | RadioRANGER Magnetic Probe Designation | Nominal Trip Ratings | | Time-Out Period | | Options | Nonreplaceable Lithium Cell | Probe Lead Length Options | |
|---|---|---|---|---|---|---|---|---|---|
| 1TR | M | 0100 | 100 A | 2 | 2 hrs | No options (leave blank) | N | G | 6 ft |
| | | 0200 | 200 A | 4 | 4 hrs | DT | | P | 12 ft |
| | | 0300 | 300 A | 8 | 8 hrs | | | Q | 20 ft |
| | | 0400 | 400 A | | | | | | |
| | | 0600 | 600 A | | | | | | |
| | | 0800 | 800 A | | | | | | |
| | | 1000 | 1000 A | | | | | | |
| | | 1200 | 1200 A | | | | | | |

**Underground Current Reset**

| Model Number | RadioRANGER Magnetic Probe Designation | Nominal Trip Ratings | | Options | Probe Lead Length Options | |
|---|---|---|---|---|---|---|
| 1CR | M | 0100 | 100 A | No options (leave blank) | G | 6 ft |
| | | 0200 | 200 A | IR | P | 12 ft |
| | | 0300 | 300 A | DT | Q | 20 ft |
| | | 0400 | 400 A | L | | |
| | | 0600 | 600 A | | | |
| | | 0800 | 800 A | | | |
| | | 1000 | 1000 A | | | |
| | | 1200 | 1200 A | | | |

**Paper-Insulated Lead Cable**

| Model Number | RadioRANGER Magnetic Probe Designation | Nominal Trip Ratings | | Mounting Range | | Time-Out Period | | Probe Lead Length Options | | Time-Current Curve Characteristic |
|---|---|---|---|---|---|---|---|---|---|---|
| PILC | M | 06 | 600 A | D | 2.2" to 2.8" | 01 | 1 hr | G | 6 ft | 1 |
| | | 08 | 800 A | | | 02 | 2 hrs | P | 12 ft | 2 |
| | | 10 | 1000 A | | | 04 | 4 hrs | Q | 20 ft | 3 |
| | | 12 | 1200 A | | | 08 | 8 hrs | | | 4 |
| | | | | | | 12 | 12 hrs | | | |
| | | | | | | 24 | 24 hrs | | | |

**RadioRANGER Starter Kit**

| Product | Model Number |
|---|---|
| Starter Kit: 1 Wireless Interface, 1 Remote Fault Reader, 3 1ARUM Fault Indicators | RRKIT101 |

# AR-URD—Underground AutoRANGER™

*Choose one low-maintenance fault indicator for your underground applications.*

*See page 20 for application with the RadioRANGER™ Wireless Fault Indication System.*

## Key Features

### System-Wide Adaptability

The Underground AutoRANGER's autoconfiguration features decrease the need for crew training, selection analysis, and inventory, resulting in fewer application errors.

### Minimal Maintenance

The AutoRANGER's ability to adjust for load fluctuations results in a decreased need for field service. Choose a target-only (no LED) display option to eliminate the need for a battery. BEACON™ LED models have a 15-plus-year product life—minimize trips to the field to replace batteries.

### Configuration Choices Optimize Performance

Ensure the best fault-indicating solution for your underground application by choosing from a wide variety of single- and three-phase display options, including remote displays that eliminate the need to open the enclosure to check the fault indicator's status.

### Autoadjusting Trip-Level Selection

Automatic trip-level selection based on sampled load current makes the AR-URD suitable for applications with fault currents ranging from as low as 50 A to greater than 1200 A. This feature simplifies ordering and inventory and reduces maintenance and application errors.

### Line-Powered Functionality

Energy required to power the microprocessor comes from monitored load current rather than a battery, decreasing maintenance and cost of ownership.

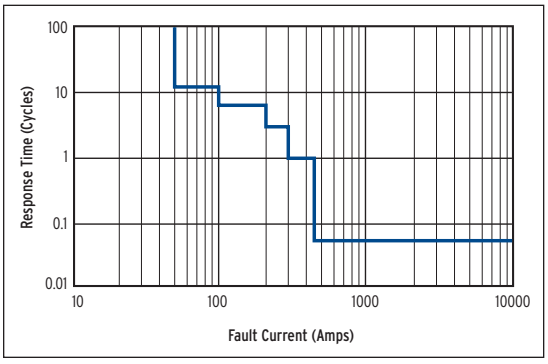
### Dynamic Trip-Response Times

By monitoring current, the AR-URD automatically adjusts its trip-response time to better coordinate with upstream protection.

### Current-Activated Timed Reset

Each AR-URD derives a normalization current as a function of measured circuit load. The AR-URD uses the normalization current to distinguish circuit restoration from backfeed current; it is this threshold that the AR-URD must detect before initiating the reset timer (0, 2, 4, or 8 hours).

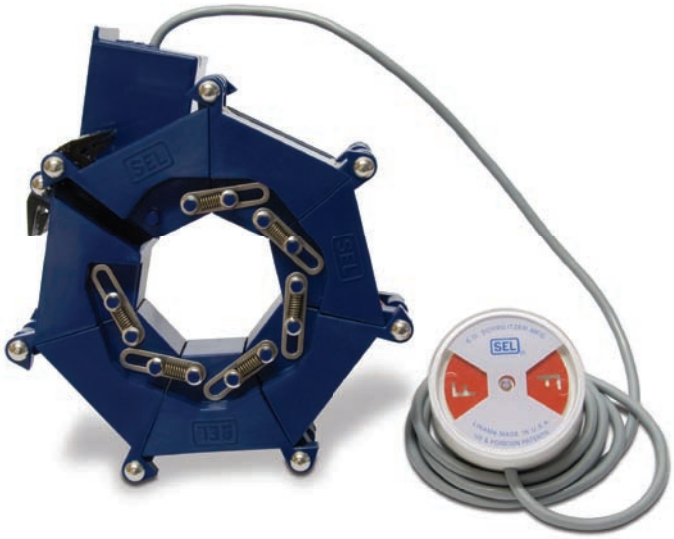
*Underground AutoRANGER application.*




*The Underground AutoRANGER's dynamic trip-response time improves coordination with upstream protection, maximizing reliable performance.*

| Specifications | |
|---|---|
| Fault-Sensing Range | 50 to 1200 A |
| Voltage Range | Equal to voltage class of shielded underground cable |
| Minimum Operating Current | 3 A |
| Current-Activated Timed Reset | 0, 2, 4, or 8 hours |
| Battery (for BEACON LED display only) | 3.6 V high-capacity 2.4 Ah lithium battery with a 20-year shelf life |
| Dynamic Trip-Response Time | Function of trip level (see graph above) |
| Inrush Restraint Response Time | 5 cycles |
| Temperature Range | −40° to +85°C |

# PILC—Paper-Insulated Lead Cable



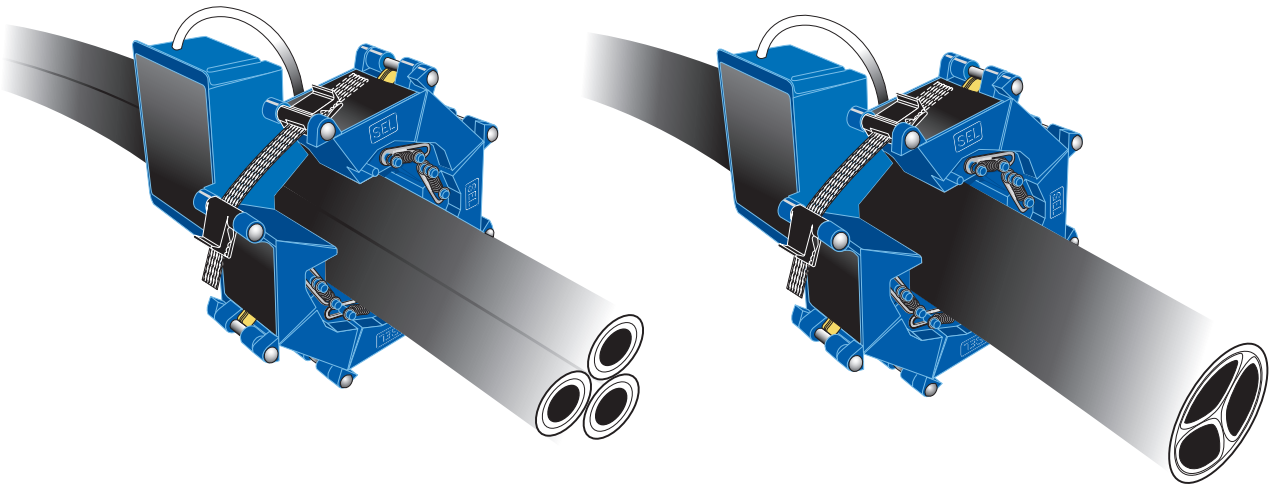
*Find faults faster on urban systems with the PILC Fault Indicator.*

*See page 20 for application with the RadioRANGER™ Wireless Fault Indication System.*

## Key Features

**Simplify Fault Finding on PILC**

- Narrows possible fault locations to one or two spans of cable.
- Choice of a remote target or RadioRANGER compatibility maximizes display options.
- Sensor design accommodates PILC diameters ranging from 2.2 to 2.8 inches.
- Four- and eight-hour timed-reset options ensure sufficient fault-finding time.
- Split-cuff design makes installation simple.
- Fully encapsulated circuitry and stainless-steel parts withstand harsh underground environments.
- Durable construction, 3.6 V lithium battery, and reliable circuitry provide more than 15 years of maintenance-free operation.



Apply the PILC Fault Indicator on triplexed, single-phase PILC (left) and on three-phase sector (or round) PILC (right). It also provides fault indication on triplexed polycable.

*For up-to-date specifications, ordering information, and application suggestions, please visit* ***www.eosmfg.com/PILC****.*

# TPR—Test Point Reset

*The most economical fault-indicating solution for elbow test point applications.*

## Key Features

- The most economical solution for underground applications.
- Easy to install on most brands of 200 A or 600 A class elbows with capacitive test points.
- Automatic reset upon restoration of system voltage.
- Ideal for pad-mounted transformer and switchgear applications.
- Several remote display options eliminate the need to open an enclosure cabinet to determine the indicator's status.
- Available in single- and three-phase models.
- Simply remove the fault indicator to access the test point.
- Auxiliary contact option for SCADA compatibility.
- Junction shield option prevents false tripping due to adjacent phase effects. Please consult factory.

*Test Point Reset Fault Indicators are available with a variety of remote displays.*

| Specifications | |
|---|---|
| Power Source | Capacitive test point voltage |
| Nominal Trip Ratings | 60 to 1200 A |
| Trip Tolerance | ±10% |
| Reset Voltage (L-N) | ≥5 kV |
| Reset | Automatic at minimum voltage |
| Reset Time | 3 minutes typical, dependent on system voltage |
| Maximum Fault Current | 25 kA for 10 cycles at 60 Hz |
| Trip Response Time | 1 ms |
| Inrush Restraint Response Time | 300 ms (add "IR" option) |
| Elbow Style | 200 A or 600 A class with test point |
| Housing Material | Conductive EPDM rubber |
| Submersibility | Up to 15 feet |
| Temperature Range | –40° to +85°C |

*A Test Point Reset Fault Indicator with junction shield provides indication in a switchgear cabinet.*

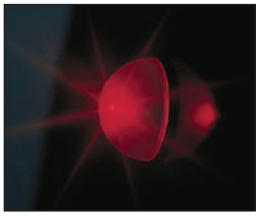
*See page 20 for application with the RadioRANGER™ Wireless Fault Indication System.*

# TR—Timed Reset

*Automatic timed reset provides permanent and transient fault-finding capability.*

## Key Features

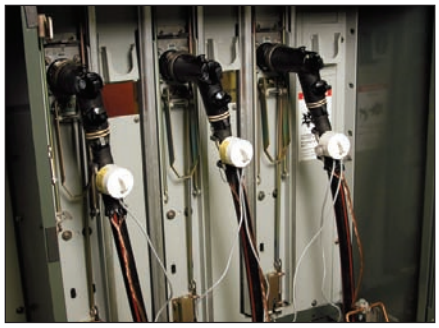
- Automatic reset at the end of a fixed reset period allows time for crews to locate permanent and transient faults.
- Ideal in locations where false reset because of feedback is a concern.
- Several remote display options eliminate the need to open an enclosure cabinet to determine the indicator's status.
- Available with test point or clamp-on sensors for single- and three-phase applications.
- Auxiliary contact option for SCADA compatibility.



*Illuminated BEACON Bolt® Display.*

| Specifications (Single Phase)* | |
|---|---|
| Nominal Trip Ratings | 50 to 1200 A |
| Trip Tolerance | ±10% |
| Maximum Fault Current | 25 kA for 10 cycles |
| Trip Response Time | 1 ms |
| Housing Material | UV-stabilized polycarbonate resin and/or conductive EPDM rubber |
| Clamp Material | Rubber-sleeved stainless steel |
| Battery (on BEACON™ models) | 3.6 V lithium battery with a 20-year shelf life and 1200 flashing hours |
| Temperature Range | –40° to +85°C |

* Please call for three-phase specifications.



*A three-phase Timed Reset Fault Indicator with a remote display (see page 3 for display options).*

*See page 20 for application with the RadioRANGER™ Wireless Fault Indication System.*

# CR — Current Reset

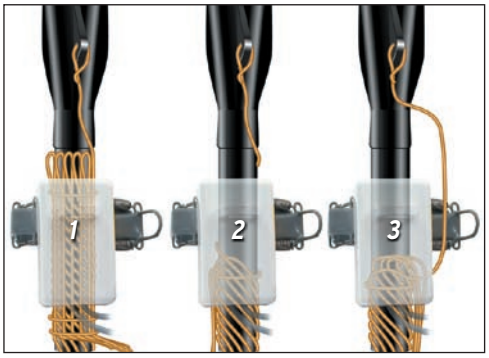
*Line-powered fault indicator provides years of maintenance-free operation.*

## Key Features

- Automatic reset upon restoration of load current.
- Closed-core design provides adjacent phase immunity.
- Available for single- and three-phase applications.
- Choose from BEACON™ LED, target, and combination displays, depending on your application and operating practices.
- Ideal for installation in pad-mounted equipment without elbow test points; install the fault indicator outside of the influence of the ground return path of the cable's concentric neutral.
- Installation on low-voltage secondary lines is an ideal fault-finding solution in industrial environments.
- Choose the auxiliary contact option for SCADA compatibility.
- Fault-powered current reset models also available for low-load current applications. Please consult factory.

| Specifications | |
|---|---|
| Power Source | |
| Current Reset | Load current ≥3 A |
| Trip Value | |
| Current Reset | 50 to 1200 A |
| Fault Powered | 200 to 800 A |
| Maximum Fault Current | 25 kA for 10 cycles |
| Trip Response Time | |
| Current Reset | 1 ms |
| Fault Powered | 8 ms nominal (function of current) |
| Outer Diameter Clamping Range | 0.75" to 2.10" (please specify clamping diameter or range when ordering) |
| Reset Requirements | 3 A |
| Housing Material | UV-stabilized polycarbonate resin |
| Clamp Material | Vinyl-coated silicon steel |
| Submersibility | Up to 15 feet |
| Temperature Range | –40° to +85°C |

*See page 20 for application with the RadioRANGER™ Wireless Fault Indication System.*




*Double-back concentric neutral training is recommended (see 1 above). Examples 2 and 3 above indicate other acceptable neutral training methods.*

*A three-phase Current Reset Fault Indicator in a switchgear application.*

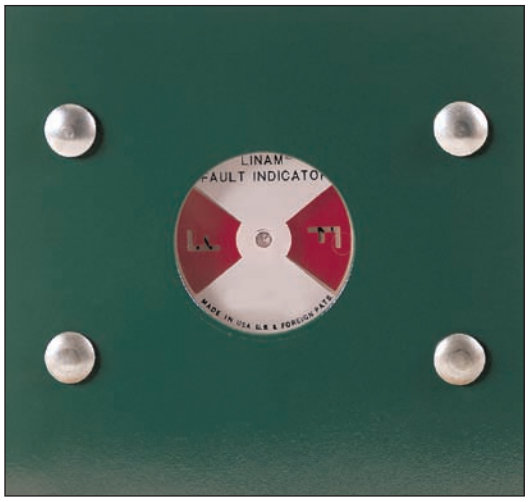
# SR—Secondary/Low-Voltage Reset

*Arms and resets from transformer secondary voltage—no minimum load current necessary.*

## Key Features

- Line-powered arm and reset eliminate the need for a battery.
- The secondary voltage supplies the necessary arm and reset requirements in applications where there is insufficient load current to use a CR product.
- Available for single- and three-phase applications.
- Choose from BEACON™ LED, target, and combination displays, depending on your application and operating practices.
- Reset restraint option prevents undesired reset from backfeed voltage. Please consult E. O. Schweitzer Manufacturing.

| Specifications | |
|---|---|
| Power Source | Secondary voltage |
| Secondary Voltage | 110 to 460 Vac |
| Nominal Trip Ratings | 50 to 1000 A |
| Trip Tolerance | ±10% |
| Reset Time | 30 seconds at 120 Vac |
| Maximum Fault Current | 25 kA for 10 cycles |
| Trip Response Time | 1 ms |
| Outer Diameter Clamping Range | 0.75" to 1.6" (please specify clamping diameter or range when ordering) |
| Housing Material | UV-stabilized polycarbonate resin |
| Clamp Material | Stainless steel |
| Temperature Range | –40° to +85°C |



*An SEL Type L large display indicates that a Secondary Reset Fault Indicator has tripped.*

# MR and MB—Manual Reset

*MB—Manual Reset Fault Indicator with a reset button.*

*MR—Manual Reset Fault Indicator.*

*Economical troubleshooting device with 50-plus years of field-proven reliability.*

## Key Features

- After a fault occurs, use an MR or MB before reclosing for inexpensive, efficient fault location.
- Line-powered, battery free.
- The built-in reset button in the MB model eliminates the need for a separate reset tool.
- The MR model is available in a convenient kit to keep on a truck—three MRs and a reset tool in a sturdy, lightweight carrying case.
- MR models are also applicable on overhead systems. MB models are only for underground applications.
- More than 50 years of field-proven reliability.

| Specifications | |
|---|---|
| Nominal Trip Ratings | |
| MB | 25 to 800 A |
| MR | 100 to 800 A |
| Trip Tolerance | ±10% |
| System Voltage Range | |
| Overhead (MR only) | Up to 38 $kV_{L-L}$ |
| Underground | Matches the URD cable rating |
| Maximum Fault Current | 25 kA for 10 cycles |
| Trip Response Time | 8 ms |
| Outer Diameter Clamping Range | 0.25" to 1.4" (please specify the clamping diameter or range when ordering) |
| Temperature Range | –40° to +85°C |
| Approximate Weight | |
| MB | 170 g (0.37 lbs) |
| MR | 140 g (0.31 lbs) |

*The Manual Reset Fault Indicator is an excellent troubleshooting tool for both overhead and underground applications.*

*Keep MR kits on a line truck as a convenient troubleshooting tool.*

# GFD — Ground Fault Detector

*Reliable ground fault detection for three-conductor cable applications.*

## Key Features

- Detects ground faults by sensing the vector sum of the current flowing through a three-conductor cable.
- Choice of three reset options (secondary voltage, load current, or time) to meet various application needs.
- Install the split-core sensor on three-phase cables without opening the primary.
- Large reflective red target is easy to see both at night and during the day.
- Submersible vinyl-coated sensing core.
- Stainless-steel hardware and UV-stabilized materials ensure long product life.
- Thousands of SEL GFDs in service today help customers around the world quickly locate ground faults.

| Specifications | |
|---|---|
| Power Source | Secondary voltage (120 to 240 $Vac_{L-N}$ at 50 to 60 Hz); load current (≥3 A); or lithium battery for timed reset products |
| Reset Time (timed reset models only) | 2, 4, or 8 hours |
| Nominal Trip Ratings | 20, 40, 50, or 100 A |
| Trip Tolerance | ±10% |
| Maximum Fault Current | 25 kA for 10 cycles |
| Trip Response Time | 1 ms |
| Outer Diameter Clamping Range | 4" (6" optional) |
| Housing Materials | UV-stabilized polycarbonate resin |
| Submersibility | Up to 15 feet |
| Temperature Range | −40° to +85°C |

*A Ground Fault Detector (Model GFD50SA) provides fault indication in the Middle East.*

# Underground Fault Indicator Ordering Tables

## Instructions for Creating Underground Fault Indicator Part Numbers

1. Select one code (in bold) from each column (i.e., 1, B, IR, etc.). It is possible to select more than one code from the Options column. List option codes in the order that they appear in the column. Please consult the factory if you are choosing more than one option from the options column. Consult E. O. Schweitzer Manufacturing if you are preparing to order a part number you have not ordered before.

2. Follow your usual process to issue a purchase order, or complete a specification for standards.

**Example Part Numbers**

1TPRV0200IRAJ

1BTPRB0600IR

1SRI0050DT

### Underground AutoRANGER™—Single-Phase

| Single-Phase | BEACON™ LED Option | Underground AutoRANGER Designation | Display | Current Activated Timed Reset Duration | Options | Factory Code |
|---|---|---|---|---|---|---|
| 1 | **–** No BEACON<br>**B** BEACON LED | **ARU** | **I** Integral<br>**V** Standard remote<br>**L** Large remote<br>**B** Bolt | **0** 0 hrs<br>**2** 2 hrs<br>**4** 4 hrs<br>**8** 8 hrs<br>**12** 12 hrs | **–** No options<br>**L** Large core 1.6" to 2.5" | **Y2** |

### Underground AutoRANGER—Three-Phase

| Three-Phase | Underground AutoRANGER Designation | Display | Current Activated Timed Reset Duration | Options | Factory Code |
|---|---|---|---|---|---|
| 3 | **ARU** | 3 | **0** 0 hrs<br>**2** 2 hrs<br>**4** 4 hrs<br>**8** 8 hrs<br>**12** 12 hrs | **–** No options<br>**L** Large core 1.6" to 2.5" | **Y2** |

### Underground Test Point Reset—Single-Phase

| Single-Phase | BEACON LED Option | Test Point Reset Designation | Display | Trip Level | Options |
|---|---|---|---|---|---|
| 1 | **–** No BEACON<br>**B** BEACON LED | **TPR** | **I** Integral<br>**V** Standard remote<br>**L** Large remote<br>**B** Bolt | **0060** 60 A<br>**0100** 100 A<br>**0120** 120 A<br>**0200** 200 A<br>**0300** 300 A<br>**0400** 400 A<br>**0600** 600 A<br>**0800** 800 A<br>**1000** 1000 A<br>**1200** 1200 A | **–** No options<br>**IR** Inrush restraint<br>**A** Auxiliary contact<br>**DT** Delayed trip (24 ms)<br>**J** Junction shields*<br>**J6** 600 A-class junction shields* |

* Required ≤200 A

### Underground Test Point Reset—Three-Phase

| Three-Phase | BEACON LED Option | Test Point Reset Designation | Display | Trip Level | Options |
|---|---|---|---|---|---|
| 3 | **–** No BEACON<br>**B** BEACON LED | **TPR** | **3** Three-phase<br>**V** Standard remote<br>**L** Large remote<br>**B** Bolt<br>**4** Three-phase target with single LED** | **0060** 60 A<br>**0100** 100 A<br>**0120** 120 A<br>**0200** 200 A<br>**0300** 300 A<br>**0400** 400 A<br>**0600** 600 A<br>**0800** 800 A<br>**1000** 1000 A<br>**1200** 1200 A | **–** No options<br>**IR** Inrush restraint<br>**A** Auxiliary contact<br>**DT** Delayed trip (24 ms)<br>**J** Junction shields*<br>**J6** 600 A-class junction shields*‡ |

* Required for trip levels below 300 A
‡ Required on 600 A-class elbows with "3" display
** Must select BEACON LED option in column 2

# Underground Fault Indicator Ordering Tables

## Underground Timed Reset—Clamp Style

| Underground Phase Designation | BEACON® LED Option | Clamp-Style Timed Reset | Display | Trip Level | Time-Out Period | Options |
|---|---|---|---|---|---|---|
| **1** Single-phase | **–** No BEACON | **TR** | **I** Integral | **0050** 50 A | **2** 2 hrs | **–** No options |
| **3** Three-phase | **B** BEACON LED | | **L** Large remote | **0100** 100 A | **4** 4 hrs | **A** Auxiliary contact |
| | | | **V** Standard remote | **0200** 200 A | **8** 8 hrs | **DT** Delayed trip (24 ms) |
| | | | **B** Bolt | **0300** 300 A | | **N** Nonreplaceable battery |
| | | | | **0400** 400 A | | **S** Snap-action clamp |
| | | | | **0600** 600 A | | |
| | | | | **0800** 800 A | | |
| | | | | **1000** 1000 A | | |
| | | | | **1200** 1200 A | | |

## Underground Timed Reset—Test Point Style

| Underground Phase Designation | BEACON LED Option | Test Point-Style Timed Reset | Display | Trip Level | Time-Out Period | Options |
|---|---|---|---|---|---|---|
| **1** Single-phase | **–** No BEACON | **TTR** | **L** Large remote | **0060** 60 A | **2** 2 hrs | **–** No options |
| **3** Three-phase | **B** BEACON LED | | **V** Standard remote | **0100** 100 A | **4** 4 hrs | **A** Auxiliary contact |
| | | | **B** Bolt | **0120** 120 A | **8** 8 hrs | **DT** Delayed trip (24 ms) |
| | | | | **0200** 200 A | | **N** Nonreplaceable battery |
| | | | | **0300** 300 A | | **J** Junction shields* |
| | | | | **0400** 400 A | | **J6** 600 A-class junction shields* |
| | | | | **0600** 600 A | | |
| | | | | **0800** 800 A | | |
| | | | | **1000** 1000 A | | |
| | | | | **1200** 1200 A | | |

## Underground Current Reset

| Underground Phase Designation | BEACON LED Option | Current Reset Designation | Display | Trip Level | Options |
|---|---|---|---|---|---|
| **1** Single-phase | **–** No BEACON | **CR** | **I** Integral | **0050** 50 A | **–** No options |
| **3** Three-phase | **B** BEACON LED | | **V** Standard remote | **0100** 100 A | **IR** Inrush restraint |
| | | | **L** Large remote | **0200** 200 A | **A** Auxiliary contact |
| | | | **B** Bolt | **0300** 300 A | **DT** Delayed trip (24 ms) |
| | | | **3** Three-phase | **0400** 400 A | **3** Three-phase reset |
| | | | **4** Three-phase target with single LED** | **0600** 600 A | **L** Large core 1.6" to 2.5" |
| | | | | **0800** 800 A | |
| | | | | **1000** 1000 A | |
| | | | | **1200** 1200 A | |

## Underground Secondary/Low-Voltage Reset

| Underground Phase Designation | BEACON LED Option | Secondary Reset Designation | Display | Trip Level | Options |
|---|---|---|---|---|---|
| **1** Single-phase | **–** No BEACON | **SR** | **I** Integral | **0050** 50 A | **–** No options |
| **3** Three-phase | **B** BEACON LED | | **V** Standard remote | **0100** 100 A | **IR** Inrush restraint |
| | | | **L** Large remote | **0200** 200 A | **RR** Reset restraint |
| | | | **B** Bolt | **0300** 300 A | **A** Auxiliary contact |
| | | | **3** Three-phase | **0400** 400 A | **DT** Delayed trip (24 ms) |
| | | | | **0600** 600 A | |
| | | | | **0800** 800 A | |
| | | | | **1000** 1000 A | |
| | | | | **1200** 1200 A | |

* Required ≤200 A

** Must select BEACON LED option in column 2

## Paper-Insulated Lead Cable

| Model Number | Large Remote Display | Nominal Trip Ratings | Mounting Range | Time-Out Period | Remote Display Lead Length Options | Time-Current Curve Characteristic |
|---|---|---|---|---|---|---|
| PILC | **L** | **06** 600 A | **D** 2.2" to 2.8" | **01** 1 hr | **G** 6 ft | **1** |
| | | **08** 800 A | | **02** 2 hrs | **P** 12 ft | **2** |
| | | **10** 1000 A | | **04** 4 hrs | **Q** 20 ft | **3** |
| | | **12** 1200 A | | **08** 8 hrs | | **4** |
| | | | | **12** 12 hrs | | |
| | | | | **24** 24 hrs | | |

# Underground Fault Indicator Ordering Tables

**Manual Reset**

| Manual Reset Designation | Trip Level | | Clamp Size |
|---|---|---|---|
| MR | **0100** | 100 A* | **–** Standard size for up to 1.4" OD cables |
| | **0200** | 200 A | **L** Large size for 0.8" to 2.0" OD cables |
| | **0400** | 400 A | **K** Kit case (MR fault indicators and 1 MT reset tool in a hard-sided carrying case) |
| | **0450** | 450 A | |
| | **0800** | 800 A | |

* MR0100 is appropriate for a 1.0" maximum cable diameter and is not available with the "L" option.

**Manual Reset With Button**

| Manual Button Designation | Trip Level | | Core Size |
|---|---|---|---|
| MB | **0025** | 25 A | **–** Standard core size for 0.6" to 1.4" OD cables |
| | **0050** | 50 A | **L** Large core size for 1.2" to 2.3" OD cables |
| | **0100** | 100 A | |
| | **0200** | 200 A | |
| | **0300** | 300 A | |
| | **0400** | 400 A | |
| | **0450** | 450 A | |
| | **0800** | 800 A | |

**Ground Fault Detectors**

| Ground Fault Detector Designation | Auxiliary Contact | Trip Response | Display | Trip Level | | Reset Type | Time-Out Period | Core Size |
|---|---|---|---|---|---|---|---|---|
| GFD | **–** No auxiliary contact | **–** Standard 1 ms trip response time | **–** Large remote | **20** | 20 A | **–** Secondary reset | **–** Not a timed reset (TR) model | **–** 100 mm core, 4.0" ID |
| | **A** Auxiliary contact | **DT** Delayed trip (24 ms) | **I** Integral | **40** | 40 A | **CR** Current reset | **2** 2 hrs | **L** 150 mm core, 6.0" ID |
| | | | **V** Small remote | **50** | 50 A | **TPR** Test point reset | **4** 4 hrs | |
| | | | **B** Bolt | **100** | 100 A | **TR** Timed reset | **8** 8 hrs | |
| | | | | | | **X** Factory-defined special | **16** 16 hrs | |
| | | | | | | | **24** 24 hrs | |

# Tools and Sensors Ordering Tables

*Tools and sensors shown starting on page 36.*

**Voltage Indicators**

| Voltage Indicator Designation | Voltage Application | |
|---|---|---|
| VIN | 200 | Capacitive test point installation |
| | 600 | Basic insulation plug installation |

**Fault Counters**

| Fault Counter Designation | Trip Level | | Inrush Restraint | Options | |
|---|---|---|---|---|---|
| FC | 0050 | 50 A | IR | – | No options |
| | 0100 | 100 A | | DT | Delayed trip (24 ms) |
| | 0200 | 200 A | | | |
| | 0300 | 300 A | | | |
| | 0400 | 400 A | | | |
| | 0600 | 600 A | | | |
| | 0800 | 800 A | | | |
| | 1000 | 1000 A | | | |

**Split-Core Current Transformers**

| Secondary Output (amps) | Primary Current (amps) | Window Diameter (in) |
|---|---|---|
| 5A | 600 | D35 |
| 5A | 600 | D45 |
| 5A | 1000 | D45 |
| 5A | 1000 | D60 |
| 5A | 2000 | D45 |
| 5A | 2000 | D60 |
| 5A | 2000 | D80 |
| 5A | 3000 | D45 |
| 5A | 3000 | D60 |
| 5A | 3000 | D80 |

## Instructions for Creating Split-Core Current Transformer Part Numbers

Each row represents a complete part number.

Select the inner diameter of your Split-Core Current Transformer by choosing a code from the Window Diameter column. For example, D35 indicates a 3.5" inner diameter, D60 indicates a 6.0" inner diameter, etc.

### Example Part Numbers

**5A600D35**
(5 A secondary output, 600 A primary current, 3.5" inner diameter)

**5A2000D45**
(5 A secondary output, 2000 A primary current, 4.5" inner diameter)

# VIN—Voltage Indicators

*Improve safety by indicating the presence of voltage.*

## Key Features

- Indicates the presence of system voltage to ensure safety.
- Flashing neon bulb indicates voltage is present. Faster flash rate indicates higher voltage.
- Install in pad-mounted transformers, switchgear, and other underground distribution enclosures with basic insulating plugs or capacitive test points.
- Applicable on most brands of test point elbows. Both 200 A and 600 A models available.
- Compact, lightweight, and durable design makes the voltage indicator easy to install.
- Three-phase version also available. Please consult E. O. Schweitzer Manufacturing.

| Specifications | |
|---|---|
| Power Source | Test point elbow terminator voltage |
| Primary Voltage (L-L) | 2 kV to 35 kV |
| Flash Response Time | 30 seconds at 2 $kV_{L-L}$ |
| Flash Rate | Proportional to voltage |
| Elbow Style | 200 A or 600 A elbows with test points or basic insulating plugs |
| Housing Material | Conductive EPDM rubber |
| Submersibility | Up to 15 feet |
| Temperature Range | –40° to +85°C |
| Approximate Weight | 100 to 180 g (0.22 to 0.40 lbs) |

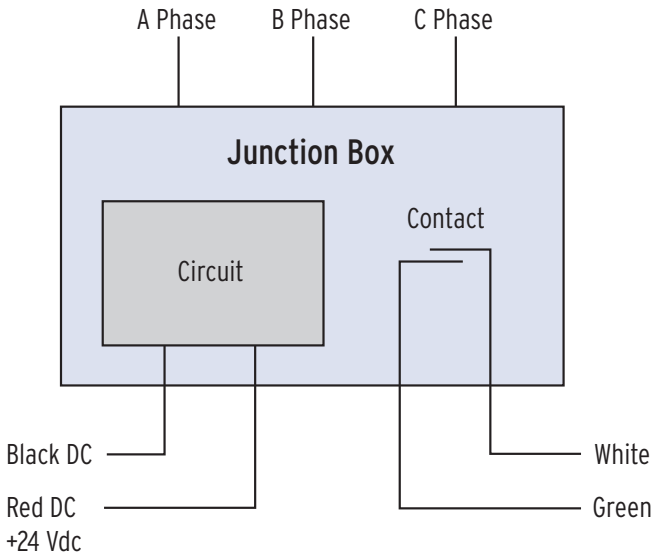
*A 200 A Voltage Indicator alerts utility personnel to the presence of voltage.*

# VS—Voltage Sensors

*Economically sense voltage and eliminate the need for potential transformers or analog sensors.*

## Key Features

- Three-phase voltage sensors detect primary system voltage on main and alternate sources in pad-mounted automatic transfer schemes.
- Voltage sensors detect voltage via the test point of the separable connector component. The presence of system voltage is indicated by an electrically isolated contact.
- E. O. Schweitzer Manufacturing makes and calibrates each voltage sensor as a complete custom solution for each application.
- Sensor circuitry monitors primary system voltage and controls contact status.
- Wye and ungrounded delta models allow you to match your system configuration.
- Contacts latch closed when system voltage on three phases is above 90 percent. Contacts latch open when system voltage on any phase drops below 75 percent. Delta units require voltage drop in two or more phases.




| Specifications | |
|---|---|
| Isolated Power Supply | 24 Vdc with a 50 mA maximum dc draw |
| Arming Requirement | 24 Vdc nominal supply voltage |
| Voltage Pull-In | ≥90% of system voltage |
| Voltage Dropout | ≤75% of system voltage |
| Phase Sensor Material | Conductive EPDM rubber |
| Separable Connector Component | 200 A or 600 A class connector with test points or basic insulating plugs |
| Voltage Class | 15, 25, or 35 kV class |
| Contact Rating | 40 VA, 1.0 A maximum, 200 Vdc maximum |

# FC—Fault Counters

*Troubleshoot problematic sections of overhead systems.*

## Key Features

- Count the number of temporary and permanent faults on sections of line with problems caused by defective insulators, tree branches, etc.
- Clock-style face with a reflective red pointer counts up to ten faults.
- Manually reset with a hot-stick-mounted tool.
- Single hot-stick installation.
- Prevent false tripping during recloser operations with the inrush restraint feature.

| Specifications | |
|---|---|
| Power Source | Electric field |
| Nominal Trip Ratings | 50 to 1200 A |
| Trip Tolerance | ±10% |
| System Voltage Range (L-N) | 5 kV to 20 kV |
| Maximum Fault Current | 25 kA for 10 cycles |
| Trip Response Time | 1 ms |
| Inrush Restraint Response Time | 300 ms |
| Outer Diameter Clamping Range | 0.25" to 1.6" (please specify clamping diameter or range when ordering) |
| Housing Material | UV-stabilized polycarbonate resin |
| Clamp Material | Rubber-sleeved stainless steel |
| Temperature Range | –40° to +85°C |
| Approximate Weight | 430 g (0.95 lbs) |

*Reset the Fault Counter with a battery-powered, hot-stick-held reset tool, model FCRT (sold separately).*

# CT—Split-Core Current Transformers

*Install current monitoring sensors without interrupting service.*

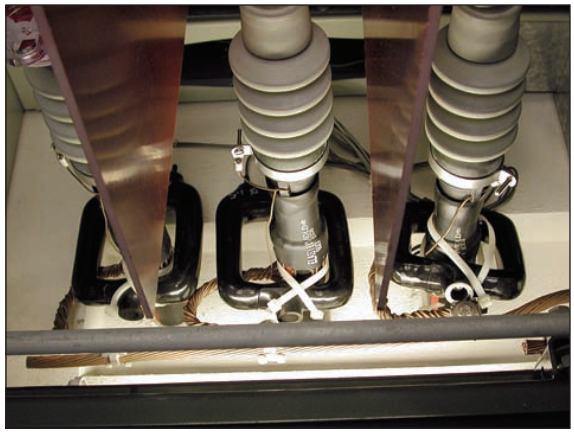
## Key Features

- Split-core design eliminates the need to open the primary cable during installation over existing bushings or cable, resulting in lower installation cost and time than closed-core designs.
- Four window diameters available: 3.5", 4.5", 6.0", and 8.0".
- Flexible encapsulation provides 600 V class insulation and ensures long product life.
- Secondary terminals are protected with vinyl coating.
- One-piece design simplifies installation and use.
- Design allows for installation when secondary load is present.

| Specifications | |
|---|---|
| Primary Current | 600 to 3000 A |
| Secondary Current | 5 A |
| Accuracy | ±3% at rated burden |
| Metering Burden | B-0.2 (ANSI C57.13) |
| Nominal Window Diameters | 3.5", 4.5", 6.0", and 8.0" |
| Core Design | Flexible split core |
| Core Material | Grain-oriented silicon steel |
| Insulation Class | 600 V (can be used on higher voltage circuits when installed over insulated conductors) |
| Secondary Winding Material | Copper |
| Electrical Terminals | Nickel-plated brass threaded posts |
| Markings | Hot stamped for polarity, catalog number, and ratio |
| Operating Temperature | –40° to +85°C |
| Installation Temperature | –10° to +85°C |

## Applications

- Electrical load surveys
- Industrial energy management systems
- Submetering for department costing
- In conjunction with:
  - Demand meters
  - Kilowatt-hour meters
  - Power factor meters
  - Current transducers
  - Watt transducers
  - Current-sensing relays



*Split-Core Current Transformers provide current measuring for a variety of switchgear applications.*

# MCG—Magnetic Cable Guide

*Keep remote display and sensor cables neat and secure.*

## Key Features

Designed to keep current sensor and remote display wiring in place against the inside of an enclosure, Magnetic Cable Guides (MCGs) are a favorite tool of customers who use fault indicators with remote displays. MCGs securely position cables against the cabinet wall, but are easy to reposition when pulling elbows, moving fault indicators, or working inside the enclosure. The magnetic strength is large enough to hold approximately 500 grams of weight when placed on a smooth surface.

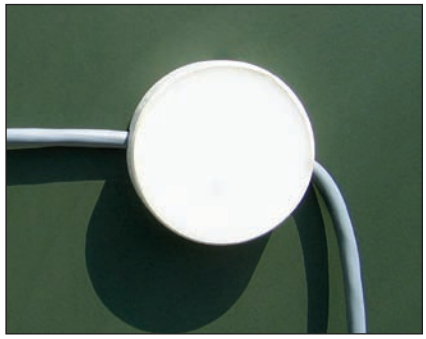
Our creative customers use the MCGs in other ways that we never imagined!

- Use a cable tie to affix an MCG to a meter. Place the meter on the side of a voltage regulator or other cabinet for hands-free operation.
- Secure fiber-optic cables to racks.
- Keep wiring neat and secure underneath surface-mount technology machines.

Purchase MCGs online at **www.sel-com.com/magnetic_cable_guides**.

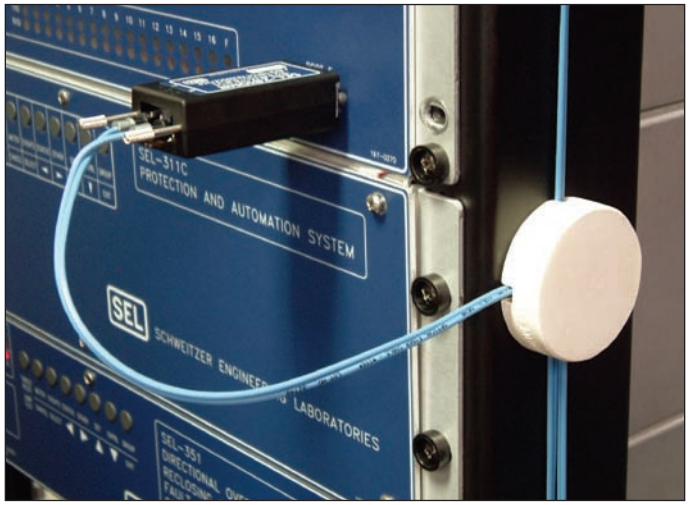
**Have a Creative Application for Magnetic Cable Guides?**

Send a photograph to **sales@eosmfg.com**, and we'll send you two free MCGs.



*MCGs keep cables neat inside of cabinets.*

*Use MCGs to hold meters to control cabinets for hands-free operation.*




*Hold fiber-optic cables against racks with MCGs.*

# Accessories and Tools

## HHT
## Silver Bolt Test Tool

Determine the status (tripped or untripped) of fault indicators with tamperproof bolt displays.

Works like a compass; the red target built into its face comes into view to indicate a tripped fault indicator.

## BTT
## BEACON™ Test Tool

Field-test fault indicators with BEACON Bolt® Displays.

## TMRT
## Gold Bolt Test and Reset Tool

Tests and resets fault-powered fault indicators with tamperproof bolt displays.

## CRSRTT
## Current and Secondary Reset Test Tool

Field-test and manually reset the AutoRANGER™, BTRIP, BTRI_IR, and other timed-reset products.

## ERLTT
## Electric Field Reset Test Tool

Use in conjunction with a hot stick to field-test electrostatic reset ERL and BER fault indicators.

## MT
## Manual Reset Tool

Manually reset the MR fault indicator.

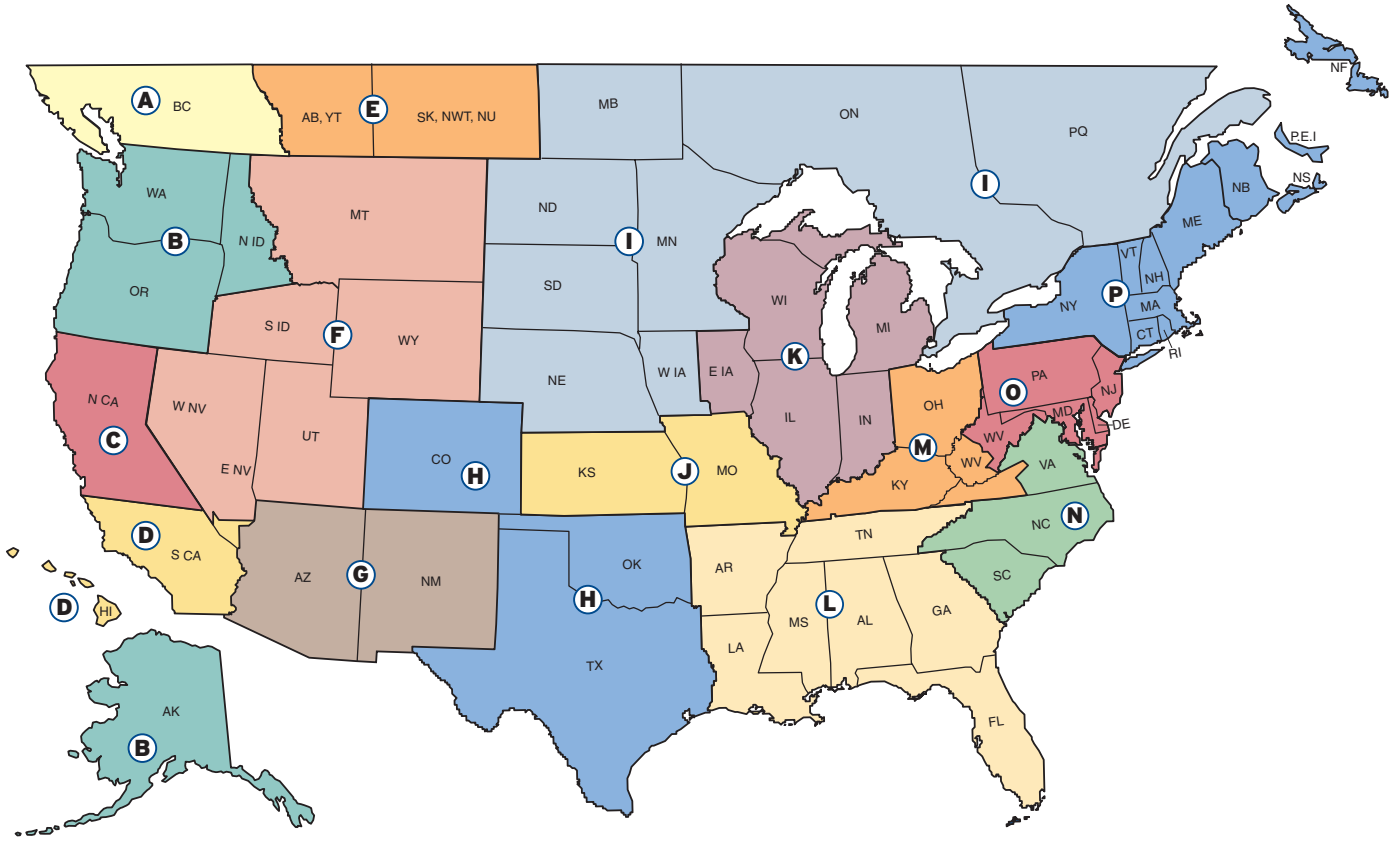
## FCRT
## Fault Counter Reset Tool

Reset the Fault Counter with this battery-powered, hot-stick-held reset tool.

(tools sold separately)

# Order SEL Products and Services Worldwide

## North America

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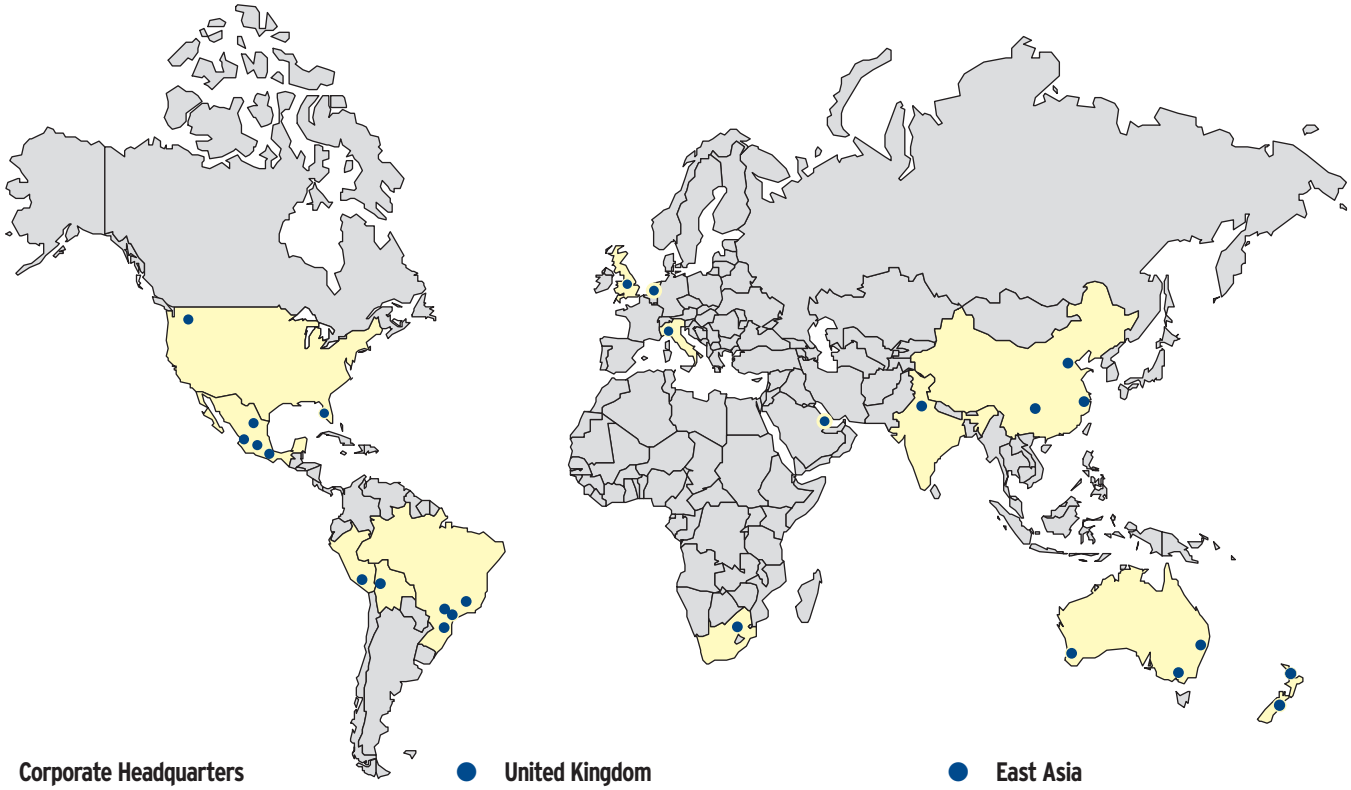

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# Top Ten Reasons to Use SEL Fault Indicators on Your Distribution System

1. **Cut Fault-Finding Time in Half.**

   Systematically applied fault indicators reduce fault-finding time by 50 percent or more, making them a powerful tool for improving reliability indices such as CAIDI (Customer Average Interruption Duration Index). Shorter outages mean reduced costs to utilities and their customers.

2. **Improve Line Crew Safety.**

   Reclosing and sectionalizing to find the location of a fault put line crew safety at risk. Use fault indicators for faster, safer fault finding.

3. **Multiple Displays and Features Meet Your Needs.**

   SEL has a solution for your application. Choose from overhead or underground models; LED, target, or radio frequency indication; and a variety of clamp and reset options. Remote displays on underground fault indicators eliminate the need to open an enclosure to determine the fault indicators' status, saving time and making life easier for troubleshooters.

4. **SEL Fault Indicators Need Zero or Little Maintenance.**

   Choose a battery-free or nonreplaceable-battery fault indicator for zero maintenance over the product's 15-plus-year lifetime. Durable construction and automatic reset mean that SEL fault indicators do not require operators' attention—unless they're doing their job of leading a line crew to the location of a fault.

5. **Locate Temporary and Permanent Faults.**

   Apply timed reset fault indicators and fault counters in areas affected by momentary outages and flickering lights to efficiently locate temporary faults. Using fault indicators reduces costs and improves distribution reliability. The Overhead AutoRANGER™ differentiates between temporary and permanent faults with distinct displays.

6. **Restore Power Faster With a Midpoint Sectionalizing Application.**

   Applying fault indicators at the midpoint of a feeder allows troubleshooters to restore power to the unaffected portion of the system...even before identifying the exact location of the fault. SEL fault indicator customers applying a midpoint sectionalizing method experience improved reliability and reduced customer outage time.

7. **Complete the Job That Protective Relays and Reclosers Start.**

   SEL relays calculate the distance from the station to a fault, but not which tap or branch the fault is on. Fault indicators complete the job by leading line crews down the correct tap so that they can restore power faster and spend less time in the field looking for the specific location of the fault.

8. **Benefit From SEL Customer Service, Field Support, and Warranty.**

   All fault indicators manufactured by E. O. Schweitzer Manufacturing come with a five-year, "no questions asked" warranty, the best in the world for fault indicators. The RadioRANGER™ Wireless Fault Indication System has a ten-year warranty.

9. **Installation Is Line Crew Friendly.**

   SEL fault indicators install without the use of special tools, straps, screws, or complicated clamping mechanisms.

10. **Fault Indicators Work!**

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*By concentrating on our purpose—making electric power safer, more reliable, and more economical—we continue to build our service to the electric power industry worldwide.*

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